Injuries in pre-professional dancers

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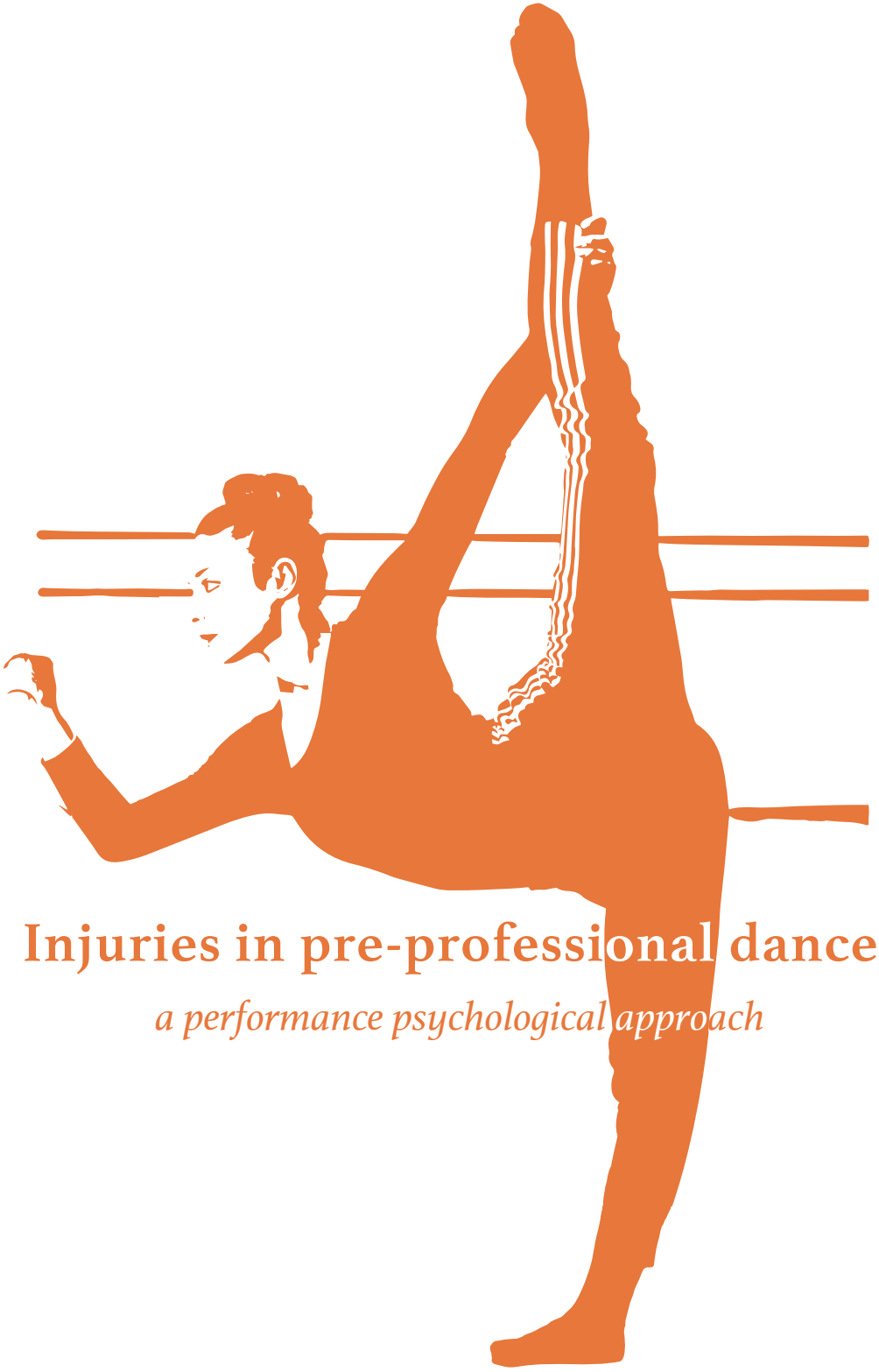

Injuries in pre-professional dancers

a performance psychological approach

P.A.M. (Diana) van Winden

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door

Petronella Apolonia Maria van Winden

geboren te Berkel en Rodenrijs

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The studies presented in this PhD thesis were conducted within Codarts Rotterdam, University of the Arts and PErforming artist and Athlete Research Lab (PEARL), in collaboration with Vrije Universiteit, Amsterdam Movement Sciences, Department of Human Movement Sciences.

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"Being injured means dealing with letting go what you love.
Its sounds really dramatic,
I know... but it is."

Marijn Rademaker
(former principal dancer Dutch National Ballet and current choreographer)

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Chapter 1. General Introduction

General Introduction

"There are three steps you have to complete to become a professional dancer: learn to dance, learn to perform, and learn how to cope with injuries."

David Gere, PhD
(founding director of the UCLA Arts & Global Health Center
and Professor in World Arts and Cultures/Dance)

Contemporary dance

Dance has been a part of human life since our early history (Chapman, 1979), constantly changing to tastes of the current society. It contributes significantly to entertainment, as well as social, cultural, and economic development, and provides a stage for cultures to be shared and stories to be told (Vassallo et al., 2019). "In every culture and in every time period people have danced - to celebrate and to mourn, to entertain and to enlighten, to affirm the spirit and the body, and to create moments of transcendent beauty and transformation [...] across language and cultural barriers." (Levine, 2005, p. 1). Dance is described as "the art where the artist is the work itself. [...] Through movements, experiences are deepened and communication is performed" (Scialom et al., 2006, p. 29). According to some of the contemporary dance students at Codarts Rotterdam, dance is "a free form of feeling and expressing yourself", and "movement, the incorporation of a body, experiencing life through your body. You sitting in that chair is already a dance, because you are in your body and you sense yourself in some way.". Other students have described it as: "a way of living, dance is everywhere", "it's me at my most natural, it's like speaking a native language, it's my home", indicating the importance of dance for its performers.

The training required for dancers is intense and just as demanding as for professional athletes (Bird, 2009). However, dance differs from the majority of sports due to its artistic expression (Toledo et al., 2004). Dancers combine both creative and athletic ability in a complex and precise manner that requires much from both the body and brain (Wallwork et al., 2017). They pursue mastery of their body "as an expressive instrument, disregarding its natural limits" (Scialom et al., 2006, p. 29). Overall, dancers must excel in both the aesthetic and technical aspects of the art, and be mentally prepared to handle the stress of critical situations and stay injury-free in order to excel (Koutedakis & Jamurtas, 2004). To illustrate the necessary aesthetical competencies, Angioi and colleagues (2009) stated that the most frequently used criteria by dance institutions and companies in auditions are, among others, the control of movements, spatial skills (i.e., spatial awareness, accuracy and intent), accuracy of movement, technique (e.g., turning and falling techniques, height of extensions, balance), dynamics, timing and rhythmical accuracy, and performance qualities. Moreover, physical dance training requires much repetition and advanced exercises, including strength, flexibility, balance, agility, kinetic perception (awareness of the body during movement), neuromuscular co-ordination, and cardiorespiratory functioning (Scialom et al., 2006).

Overall, numerous dance styles exist, such as ballet, hip hop, jazz, tap dance, Irish dance, modern and contemporary dance. This thesis places a particular focus on contemporary dance, as contemporary dance continues to grow in popularity throughout the world (R. Martin, 2013).

Contemporary dance combines different styles and genres of dance such as classical ballet, modern and jazz (R. Martin, 2013). This unique range in dance styles provides dancers with opportunities to craft their own artistic identity (Codarts Rotterdam, 2020b). According to a number of choreographers, contemporary dance is characterised by specific aesthetic values, with common traits such as experimental elements, a conceptual framework, or the inclusion of improvisation, text, or multimedia elements (Giguere, 2018). Contemporary dance has rebelled against the norm and the constraints that the more classical-oriented styles, such as ballet, have placed on the body, preferring to use the entire body and person as an expressive whole (Morrison, 1979; Wyon, 2009).

Codarts Rotterdam

In the Dutch artistic dance sector numerous dance teachers, dance students and professional dancers are active, and it is characterised by great expertise and continuously new developments (Raad voor Cultuur, 2018). In order to become a professional contemporary dancer, it is desirable to follow a pre-professional educational programme at several dance institutes across the world. Codarts Rotterdam, the specific setting of this thesis, is one of the seven Dutch-based international universities that offers high-quality, professional arts education in the fields of music, dance and circus to approximately 1,000 students of 65 different nationalities, of which approximately 190 are dance students. Only 5% of audition candidates for the Bachelor Dance are selected each year. Many graduates join Dutch or internationally renowned dance companies, such as Nederlands Dans Theater (NDT; the Netherlands), Akram Khan Company (United Kingdom), Tanzcompagnie Konzert Theater Bern (Switzerland) and Hofesh Shechter Company (United Kingdom). The student population consists of young adults (minimum age: 16), with different cultural and dance backgrounds.

Codarts Rotterdam trains dancers who, as adaptive professionals and on the basis of their personal artistic identity, are able to claim their own place in the world of dance. The institute facilitates two four-year full-time dance programmes, i.e., Bachelor Dance or Bachelor Dance Teacher (also known as 'Dance and Education'). Within the Bachelor Dance, the overall focus is on building stage experience, for instance via internships with dance companies. Whereas students on the Bachelor Dance Teacher

focus on teaching skills (i.e., dance didactics), Community Arts projects and broader dance styles (e.g., world dance, tap dance and urban) (Codarts Rotterdam, 2020b, 2020a). Moreover, both Bachelor programmes focus on acquiring the required technical dance competencies with classes containing a wide range of modern techniques (e.g., Cunningham, Graham, Laban, Limon), (modern) jazz, ballet, and 'floorwork'. In addition, a large number of guest teachers contribute their personal styles, often inspired by their own development and research. Furthermore, performance creative skills (i.e., improvisation, composition and drama) are important. Students learn repertoire and create new work together with (guest) choreographers and teachers from the professional field and gain further stage experience by performing.

Within Codarts Rotterdam, a specific department called 'Student Life' provides high-quality student support on performance enhancement, personal development, injury prevention and general well-being with the provision of information, training, guidance and care. Student Life consists of, among others, the Performing Arts Health Centre team, study coaches, a student counsellor and collaborations with many partners, such as human movement scientists. They focus on health screening, education on health aspects (e.g., nutrition, anatomy, psychology), services and facilities, and research and development.

Overall, the dance students spend most of their time at school, with a typical day running from 9 am to 6 pm (Stubbe et al., 2021). Each study year, the educational programme consists of the same workload (1,680 study-hours, including preparation, classes, and tests); however, the ratio of physical-theoreti¬cal classes differs between the two dance Bachelors. The Bachelor Dance curriculum contains 75% physical classes (dance exposure of 1,267.5 hours), whereas the Bachelor Dance Teacher contains 50% physical and 50% theoretical classes (dance exposure of 825.5 hours) (van Winden et al., 2020a). However, Dance Teacher students may want to stay involved in classes or performances besides the opportunities within their school, as this will add to their dance experience, thus increasing their workload alongside the regular school load (Balk et al., 2018).

Physical and mental health in dance

Professional dance is a demanding career path, combining high levels of physical and artistic ability (Koutedakis & Jamurtas, 2004). Therefore, contemporary dance students participate in long hours of classes, rehearsals and performances (Kenny et al., 2016). Combined with tight schedules, this may result in insufficient recovery (Grove et al., 2013; Twitchett et al., 2010).

Training consists of repetitive movements (Ekegren et al., 2014; Gamboa et al., 2008), usually exceeding anatomical limitations (e.g., turnout, arching) (Luke et al., 2002) and demanding versatility (e.g., improvisation, excessive style variations, for instance between choreographers) (Weigert & Erickson, 2007; Weiss et al., 2008). Overall, the high physiological and psychological demands of dancing and/or dance teaching means that students are prone to health-related problems, such as injuries and mental health problems (Grove et al., 2013; Kenny et al., 2016; Laws & Apps, 2005; Wanke et al., 2015).

For dance students, health problems can have tremendous effects leading to discomfort, medical treatment and inhibition of artistic development due to absences from dance activities (i.e., classes, rehearsals and performances) (Kenny et al., 2016). Especially for injuries, the inability to participate in classes can negatively impact academic success and professional development (i.e., study delay and dropping out of university). Hence, injury prevention is not only relevant for their future role as a dancer or dance teacher; it is also essential for themselves as a dance student.

Furthermore, it has been stated numerous times that mental health is a necessary basis in order to optimise performance and development in sports (Schinke et al., 2018). Mental health involves effective functioning in daily activities resulting in productive activities, healthy relationships, and the ability to adapt to change and cope with adversity (American Psychiatric Association, 2018), whereas mental health problems (i.e., mental health issues or complaints) result in diffi¬culties with these aspects, such as concentration difficul¬ties, low self-confidence, anxiety, and stress. Overall, mental health problems can be severely disadvantageous for dance students and result in persistent fatigue, performance decrements, feelings of lower achievement, devaluation and resentment of a previously enjoyable activity (Goodger et al., 2007; Grove et al., 2013).

Consequently, for a successful, sustainable study period and career, prevention of physical (i.e., injuries) and mental health problems is essential. Within this thesis, the main focus is on injury prevention and the related mental health aspects of injuries.

Injury prevention framework

To gain more insight into the injury problem and work towards prevention, the four-step framework of van Mechelen and colleagues (1992) can provide guidance (Figure 1.1). The first step focuses on identifying the magnitude of the problem by describing the extent of the issue and its characteristics.

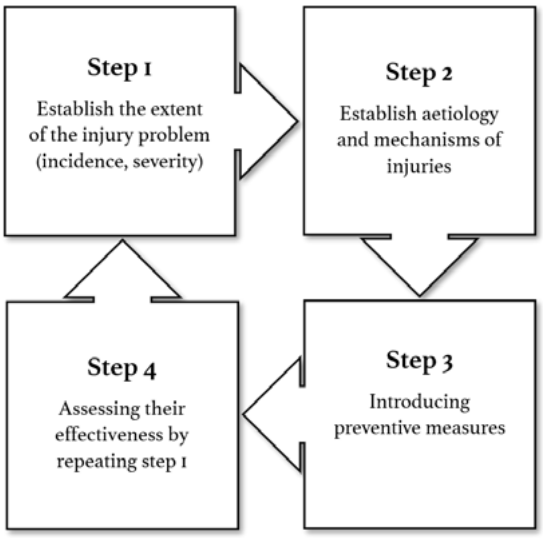

Figure 1.1 The four-step sequence of prevention for injury prevention research.
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Step 2 of the framework, determining the risk factors and injury mechanisms, is of great importance for the eventual introduction and assessment of the effectiveness of preventive measures, depicted in Steps 3 and 4. In sum, the model states that before preventive measures are implemented, evidence-based knowledge is needed regarding incidence, characteristics, aetiology, and injury mechanisms. The following paragraphs illustrate the most important and current body of dance injury literature, focusing on the first two steps of the model.

Prevalence of health problems in dance

As mentioned above, Step 1 in injury prevention is gaining insight into the incidence and severity of the injury problem. Without this information, it is not possible to introduce preventive measures. However, to our knowledge, only a few studies have investigated the extent of injuries within our specific sample (i.e., contemporary dance students), for instance Baker and colleagues (2010) and Lee and colleagues (2017). Overall, prevalence and incidence rates of injuries among pre-professional ballet, modern and contemporary dancers range from 37–86% and from 0.77–4.71 injuries per 1,000 hours of dance (Kenny et al., 2016; Lee et al., 2017), showing that dance students are injury prone. In particular, a high prevalence and incidence of lower extremity, hip and back injuries have been shown in dancers (Jacobs et al., 2012). However, these results should be interpreted with caution due to their low quality (Kenny et al., 2016), as a result of retrospective designs, high numbers of missing data, low numbers of participants, different levels of dance and/or different injury definitions.

Furthermore, to our knowledge, only one retrospective study has reported incidence proportions of multiple mental health problems in contemporary dance students, indicating that 92% of dancers experienced at least one mental health problem within one year (Laws & Apps, 2005). Other studies did look into specific mental health problems within ballet and/or contemporary dance students, such as prevalence of the history of disordered eating behaviours (31.3%) (J. J. Thomas et al., 2011) and perfectionistic tendencies (84.9%) (Nordin-Bates et al., 2011). Results show that students with greater perfectionistic tendencies (40.6%) experienced greater cognitive and somatic anxiety, and lower self-confidence.

In short, there are no high-quality recent prospective studies on mental health problems and/or injuries in contemporary dance students available within the literature, while there are indications that these are prevalent in this population.

Injuries risk factors

The injury risk in dancers is high, due to the great physical, psychological and artistic demands of dance training, particularly at the pre-professional level (Bird, 2009; Kenny et al., 2016). In dance research, the most investigated risk factors are anthropometrics (i.e., low body mass index, low adiposity), joint range of motion (i.e., lower extremity), dance exposure (i.e., years training, exposure hours) and age (Kenny et al., 2016). Furthermore, (low-quality) randomised controlled trials and cohort studies have indicated that previous injury, poor aerobic capacity, limited ankle dorsiflexion for lower-extremity injuries and insufficient coping skills are additional risk factors (Kenny et al., 2016; van Seters et al., 2020). Lower extremity alignment, jump landing technique, negative stress, perfectionism and mood states (self-reported feelings of fatigue) are shown to be correlated with injury in cross-sectional studies, in which the direction of these associations could not be established (Kenny et al., 2016). Finally, a qualitative study showed that dancers indicate an imbalance between workload and their capacity to deal with the load as the main reason for sustaining injuries (Bolling et al., 2021).

Although multiple risk factors have already been identified, consensus regarding risk factors for injuries in dance students remains difficult due to different methods, definitions and dance styles (Kenny et al., 2016). Previous studies aiming at identifying risk factors for ballet and modern dance injuries have shown little consistency due to a lack of quality and level of evidence. Moreover, dance medicine and science has traditionally focused on the physical (physiological and biomechanical) aspects of injuries

(Krasnow et al., 1999; Liederbach & Compagno, 2001; Mainwaring & Finney, 2017), while studies including dancers and athletes have shown that psychological constructs might also influence the occurrence of (dance) injuries (Mainwaring & Finney, 2017; Reardon et al., 2019). Further, dancers themselves felt that their injuries were as much connected with psychological factors as with physical factors (Patterson et al., 1998). Furthermore, mental skills can be considered adaptable (Kenny et al., 2016), which makes them appropriate for implementation in preventive measures.

In order to provide a theoretical framework to clarify the relationship between mental aspects and sport injury occurrence, Williams and Andersen (1998) proposed the stress-and-injury model (Figure 1.2). Due to the training and performance parallels between sports and dance, the model can be applied to dance-specific examples as well (Noh et al., 2007; Pollitt & Hutt, 2021). Which is illustrated by the results of the systematic review of Mainwaring and Finney (2017), indicating associations between stress, psychological distress, coping and personality with risk of injury. The model suggests that psychosocial factors, such as personality, history of stressors, and coping resources, influence the stress response and, thus, the likelihood of injury occurrence via physiological (e.g., muscle tension) and attentional changes (e.g., distractibility and perceptual narrowing).

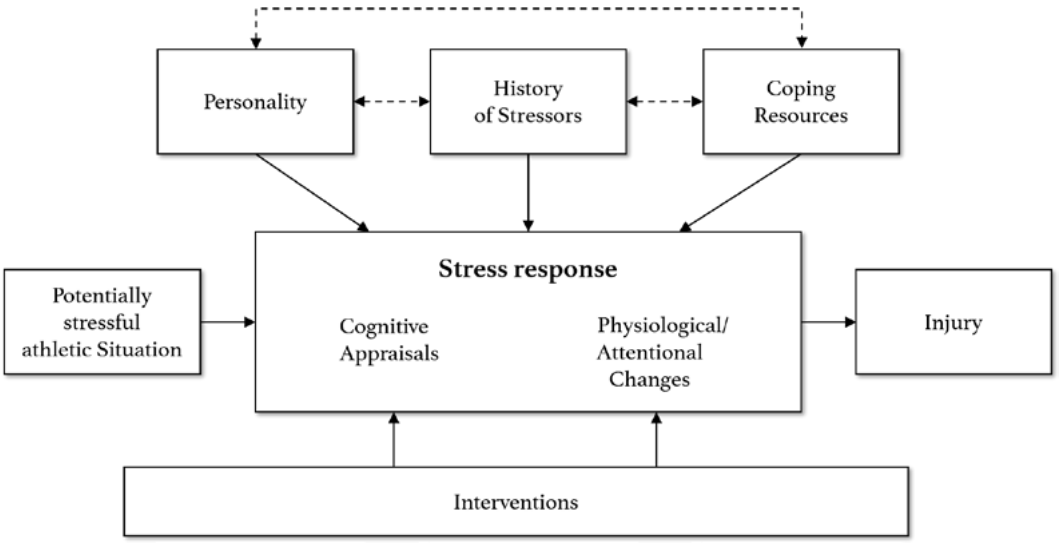

Figure 1.2. The stress-and-injury model (Williams & Andersen, 1998).
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According to a meta-analysis of Ivarsson and colleagues (2017), high levels of stress due to negative life-events and strong stress responsivity have the strongest relationship with injury risk in sports. These stressors can arise from both the individual themselves and their environment, with dance examples constituting aspects such as high expectations from others, competition, job instability, and a demanding training schedule (Adam et al., 2004; Krasnow et al., 1999). In addition, competitive auditions, approaching performances, relationships with choreographers, maintaining the ideal body weight and living away from home are specific examples of stressors unique to dance students (Mainwaring et al., 1993). Studies including pre-professional ballet and modern dance students showed associations between injuries and psychological coping skills (Noh et al., 2005, 2007), negative stress (Krasnow et al., 1999; Mainwaring et al., 1993), fatigue (Liederbach & Compagno, 2001) and indications towards perfectionism (Krasnow et al., 1999; Liederbach & Compagno, 2001). However, these studies did not include contemporary dance students or had a low methodological quality (Kenny et al., 2016). Hence, there are no high-quality recent prospective studies on mental risk factors of injuries in contemporary dance students available in the literature.

Mental aspects of injury rehabilitation

Dancers tend to define an injury as something that stops them from dancing or from moving normally (i.e., performance limitations) (Bolling et al., 2021; H. Thomas & Tarr, 2009). However, dancers are likely to ignore an injury, sometimes even to the point of causing more severe damage and psychological distress (Harrison & Ruddock-Hudson, 2017; Mainwaring et al., 2001). Dancers are under substantial pressure to remain dedicated and persevere through their pain (Grove et al., 2013). Therefore, it is assumed that dancers do not fully recover from their initial injury (Kenny et al., 2016). The importance of rehabilitation from an incurred injury prior to returning to full dance training might be an essential aspect of dance education and injury prevention of young dancers (Kenny et al., 2016), and should receive more attention. For younger dancers this is particularly relevant due to the limited timeframe for achieving their artistic and academic goals as well as the financial implications of injury (Weigert, 2005). In addition, there is an increased risk of ignoring pain as young dancers often have insufficient knowledge for managing their injuries and could feel the need to hide pain to please or gain the approval of their teachers (Mainwaring et al., 2001).

In addition, it has been noticed that the greater the severity of the injury, the higher the chances for a negative emotional experience (Ivarsson et al., 2017).

Dance injuries have been associated with higher levels of stress, anxiety, depression, anger, fatigue, confusion, sleep problems, disordered eating, and overall psychosocial challenges (Adam et al., 2004; Higginbotham & Cahalan, 2020; Mainwaring & Finney, 2017).

The integrated model of response to sport injury (Wiese-Bjornstal et al., 1998) provides theoretical support for the importance of addressing psychosocial responses for successful recovery, in line with the stress-and-injury model of Williams and Andersen (1998) (Figure 1.2). According to the model, responses to injury are influenced by both pre-injury and post-injury factors (i.e., personal and situational factors). The way the injury and the rehabilitation process are interpreted (i.e., the cognitive response) is thought to affect the emotional and behavioural responses, and vice versa.

Understanding the theory underneath the psychosocial responses to injuries may help the pre-professional dance environment (i.e., dance students, dance schools, teachers, directors and health care professionals) endorse a more holistic approach by choosing appropriate (individualised) psychological strategies to help dance students proceed through rehabilitation and get successfully back to performing. However, to our knowledge, these responses within the dance injury setting are rather unclear.

Thesis objectives and outline

The previous paragraphs illustrate the limited body of knowledge on contemporary dance students' health problems. To recapitulate, there is a lack of high-quality studies within dance on physical (i.e., injuries) and mental health problems, and the (mental) risk factors. Furthermore, in-depth studies on psychosocial responses to dance injuries and their recovery process are currently lacking. Therefore, this thesis aims to develop knowledge on incidence, characteristics, risk factors of and responses to injuries in contemporary dance students, as well as the incidence and characteristics of mental health problems. Such knowledge is essential to the pre-professional dance environment (i.e., dance students, dance schools, teachers, directors and health care professionals) because of the great risks and highly negative consequences of these health problems. These insights enable us to develop preventive measures, and can better equip health professionals and dance teachers to help dance students navigate the injury-recovery process, and dealing with their mental health.

The following research questions were formulated:

1) What is the incidence of injuries and mental health problems in contemporary dance students?

2) What are mental risk factors regarding injuries in contemporary dance students?

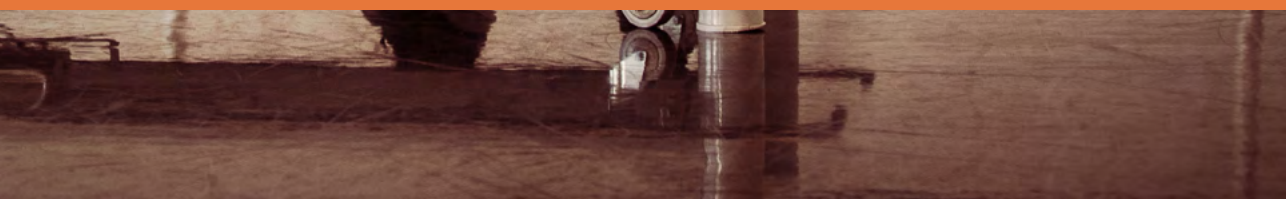
3) What are the psychosocial responses of contemporary dance students during injury rehabilitation?

This thesis is outlined in eight chapters. After the general introduction in Chapter 1, the incidence and characteristics of dance injuries are presented in Chapter 2. Chapter 3 describes the incidence and characteristics of mental health problems. Chapter 4 addresses psychological risk factors of substantial injuries in dance students, namely coping skills, perfectionism, and self-regulation, whereas Chapter 5 focuses on the association between injuries and stress. Chapter 6 provides insight into the main psychosocial aspects during the rehabilitation process of a dance injury. Chapter 7 presents the effects of the corona virus disease (COVID-19) restrictions on the prevalence of mental health problems within performing arts students. This unique period in time was characterised by the first lockdowns of society due to the global pandemic of COVID-19. It was possible that this period of lockdown and isolation could have negative implications for the health and well-being of dance students. This thesis finishes with Chapter 8, in which the main research questions are answered, the core methodological considerations and implications for future research and practice are discussed, alongside an overall conclusion to the thesis.

Chapter 2.

Detailed injury epidemiology in contemporary dance: a 1-year prospective study of 134 students

van Winden, D., van Rijn, R. M., Richardson, A., Savelsbergh, G. J. P., Oudejans, R. R. D., & Stubbe, J. H. (2019). BMJ Open Sport & Exercise Medicine, 5(1), e000453.



Abstract

Aim

This study investigated the extent and characteristics of injuries in contemporary dance students, since clear insight into incidence and characteristics of these physical health problems is limited.

Methods

During one academic year, 134 students of Bachelor dance and Bachelor dance teacher from Codarts University of the Arts (Rotterdam, the Netherlands) were prospectively monitored on monthly basis, using the Performing Artist and Athlete Health Monitor (PAHM) which includes the Oslo Sports Trauma Research Centre Questionnaire on Health Problems.

Results

130 students were included in the analyses. The response rate of monthly completed questionnaires was 79.7%. During the academic year, 96.9% of the students reported at least one injury, mental complaint, or other health problem. The one-year injury incidence proportion (IP) was 80.8%. Of these injured students, 58.1% were substantially injured (i.e., problems leading to moderate or severe reductions in training volume or performance or complete inability to participate in activities). The monthly IP of all injuries ranged from 23.1–42.6% and for substantial injuries from 5.8–16.8%. The injury incidence rate per 1,000 hours dance exposure was 1.9 (95% CI = 1.7 to 2.2). Ankle/foot (30.3%), lower back (17.3%) and knee (14.6%) were the most common injury locations.

Conclusion

Contemporary dance students are at high risk for injuries. Injury prevention programmes among contemporary dance students should focus on the ankle/foot, lower back and knee.

Introduction

Contemporary dance students participate in long hours of training (Kenny et al., 2016), consisting of repetitive movements (Ekegren et al., 2014; Gamboa et al., 2008), exceeding anatomical limitations (e.g., turnout, arching) (Luke et al., 2002) and demanding versatility (e.g., improvisation, inversions) (Kenny et al., 2016). These demands make a dance student prone to physical health problems (Kenny et al., 2016), especially during periods of maturation and development according to their age (Bowerman et al., 2014; Lee et al., 2017). Physical health problems can lead to discomfort, require medical treatment, and inhibit artistic development due to absence from dance activities (i.e., classes, rehearsals and performances) (Kenny et al., 2016). In extreme cases, they can lead to study delay and even dropping out of college (Ekegren et al., 2014).

According to Kenny and colleagues injury incidence rates ranged from 0.77 to 4.71 per 1,000 hours of dance exposure within pre-professional ballet and/or contemporary dancers (Kenny et al., 2016). These data resulted from a very broad injury definition ('any physical complaint irrespective of the need for medical attention or full time loss from dance activities'). On the other hand, only reporting time-loss and/or medical attention injuries will lead to an underestimation of the full extent of injury problems (Kenny et al., 2018). About 90% of overuse injuries will not be registered as an injury when focusing on time loss injuries (Clarsen et al., 2013), whereas the majority of injuries by pre-professional ballet dancers (54–85%) appear to be overuse in nature (Caine et al., 2015). We argue that injury surveillance methods should use inclusive injury definitions (Kenny et al., 2018).

In 2013, a new surveillance method was reported by Norwegian clinician-academics. The Oslo Sports Trauma Research Centre (OSTRC) Overuse Injury Questionnaire was designed to address the limitation of injury registration that only counted 'time loss' injuries (Clarsen et al., 2013). The new method captured all types of health problems — non-time loss injuries ('overuse') and time loss injuries (often 'acute' or more severe overuse injuries) (Clarsen et al., 2014; Pluim et al., 2016). Although this method has been used multiple times within athletic groups (Richardson et al., 2017; van Beijsterveldt et al., 2017), only one study has applied this method in dance (Kenny et al., 2018).

Insight into the extent of physical health problems can give direction to future research into the aetiology of injuries and the development of preventive strategies (Finch, 2006; van Mechelen et al., 1992). We aimed to establish the extent (amount, incidence) and characteristics (severity, location) of injuries in contemporary dance students using the OSTRC Overuse Injury Questionnaire (Clarsen et al., 2013, 2014).

Materials and Methods

Participants

A total of 134 first-, second- and third-year contemporary dance students, were prospectively followed during the entire academic year (September 2016 to June 2017). Students were enrolled in the four-year educational programme of Bachelor Dance or Bachelor Dance Teacher of Codarts University of the Arts, Rotterdam, the Netherlands. Our data was routinely collected as part of the curriculum for management and educational purposes. All students were informed about the procedure and provided written informed consent. The study was approved by the Scientific and Ethical Review Board (VCWE) of the Vrije Universiteit Amsterdam. The Dutch Central Committee on Research Involving Human Subjects (CCMO) stated that no medical ethical approval was necessary for this questionnaire study, as stated in the Dutch Medical Research Involving Human Subjects Act (http://www.ccmo.nl/nl/toetsingscommissie-ccmo-of-metc?55a37b93-dd8c-4bf8-8883-2d30c35ff8ba).

Procedures

During the first month of the academic year (September 2016), baseline characteristics were recorded, including age (years), height (centimetres), and body weight (kilograms). During the academic year 2016/2017, all students were asked to complete monthly questionnaires by using the Performing Artist and Athletes Health Monitor (PAHM) (Stubbe et al., 2018), a web-based system which includes a Dutch translation of the OSTRC Questionnaire on Health Problems (Clarsen et al., 2014; Richardson et al., 2017; van Beijsterveldt et al., 2017). Only students who completed >30% of the questionnaires were included in the analyses.

Injury Registration

The OSTRC Questionnaire consists of four key questions about the consequences of health problems on participation, training volume, and performance as well as the degree to which the student perceived symptoms. All items ranged from 0 (no problem, no reduction, no effect or no symptoms) to 25 (cannot participate at all or severe symptoms) (Clarsen et al., 2013). Questions 1 and 4 were scored on a four-point scale (0-8-17-25), while questions 2 and 3 were scored on a five-point scale (0-6-13-19-25). The severity of a health problem was calculated by the sum score of the four questions (scale 0-100) according to the method proposed by Clarsen et al (2013).

If the severity score was higher than zero, a health problem was registered and the student was asked whether the health problem was an injury, mental problem or other problem. For injuries, the student was automatically directed to an injury registration form based on an international consensus statement on injury surveillance methodology for football to collect further details (e.g., location, history and acute or overuse onset) (Fuller et al., 2006). An injury was defined as any physical complaint sustained by a dancer resulting in a severity score higher than zero (i.e., leading to consequences on participation, training volume, and/or performance), irrespective of the need for medical attention or time loss from dance activities.

Students were defined as substantial injured if they reported problems leading to moderate or severe reductions (value ≥13 on question 2 or 3 of the OSTRC) in training volume or moderate or severe reductions in performance or complete inability to participate in dance (Clarsen et al., 2014). If a student reported the same injury as most severe health problem in two or more consecutive questionnaires, this was counted as one 'unique' case of a (fluctuating) problem (Stubbe et al., 2018; van Beijsterveldt et al., 2017).

Dance Exposure

Dance exposure was defined as, 'one dancer participating in one class, rehearsal or performance in which he or she is exposed to the possibility of dance injury weighted for time doing activity' (Liederbach et al., 2012), and measured as unit of time (hours) spending on physical dance activities. Total dance exposure was calculated as an average, based on the weekly timetables for the first-year, second-year and third-year students of the educational programme of Bachelor Dance and Bachelor Dance Teacher.

Statistical Analysis

All statistical procedures were performed using SPSS V.23 (IBM, Armonk, USA). Descriptive statistics were used to describe baseline characteristics using means and standard deviation (SD) or number and percentages (%). The (substantial) injury incidence proportion (IP) for one academic year and per month was calculated by dividing the number of students that reported at least one (substantial) injury during the academic year/month by the number of respondents in that same period (Knowles et al., 2006). Injury incidence rate, with corresponding 95% CI, was calculated as the number of unique injuries per 1,000 hours of dance exposure (Knowles et al., 2006). The severity of the unique injuries was calculated by the mean (SD) number of full days that a student completely/partly missed their dance activities due to their injury. Characteristics (i.e., location) of injuries were expressed in percentages for the total of unique injuries.

Results

Response and baseline characteristics

Baseline characteristics of all students are shown in Table 2.1. A total of 137 students were enrolled in the educational programmes, 134 students gave consent to participate, and finally 130 students were included in the analyses. The four excluded students all dropped out of the educational programme within four months due to personal reasons (no injuries), resulting in a response lower than 30%. In total, 1,279 questionnaires were sent to the students and 1,020 were completed, resulting in a response rate of 79.7%.

Health problems

During the academic year, 96.9% (N = 126) of the students reported at least one health problem, of which 64.3% (N = 81) reported a substantial health problem. In the 10 monthly questionnaires, a total of 620 health problems were reported consisting of 321 injuries (51.8%), 67 mental problems (10.8%) and 232 other health problems, including illnesses (37.4%).

Injury Incidence

The injury IP for one academic year was 80.8% (N = 105), of which 58.1% students (N = 61) had a substantial injury. Figure 2.1 shows that the monthly IP of all injuries ranged from 23.1% to 42.6% and from 5.8% to 16.8% for substantial injuries. The mean monthly OSTRC severity score for all injuries was 35.3 (SD = 5.8) and for substantial injuries 57.0 (SD = 4.7; Figure 2.2).

Table 2.1. Baseline characteristics shown as mean (±SD) or number (percentage).

	Overall
N	134
Education programme (Bachelor dance)	84 (62.7%)
First year students	49 (36.6%)
Second year students	44 (32.8%)
Third year students	41 (30.6%)
Sex (female)	90 (67.2%)
Age (years)	19.4 ± 1.5
BMI (kg/m²)	21.0 ± 1.8
Dance exposure (total hours academic year 2016/2017 per student)	1046.5

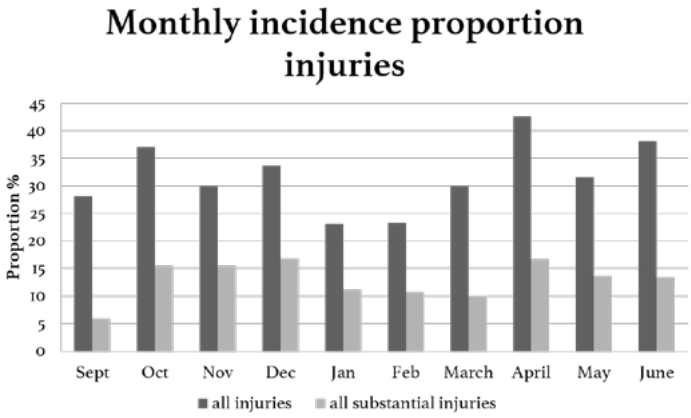


Figure 2.1. Monthly incidence proportion of all and substantial injuries during the full academic year of 2016/2017.

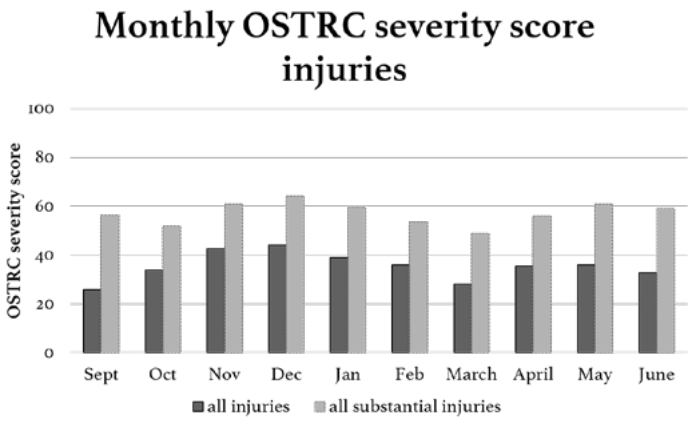


Figure 2.2. Mean monthly OSTRC severity scores of all and substantial injuries during the full academic year of 2016/2017. OSTRC, Oslo Sports Trauma Research Centre.

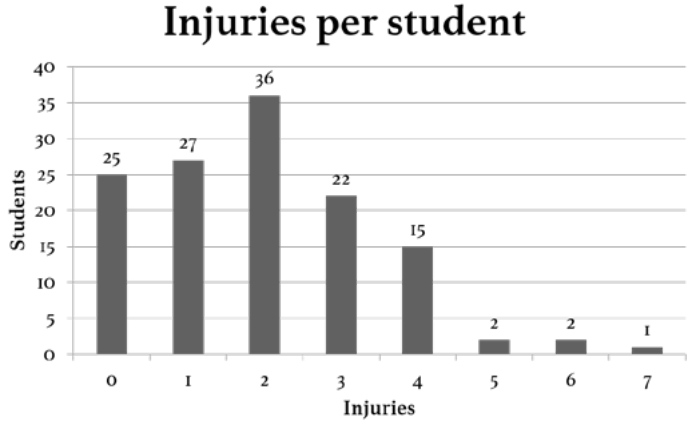


Figure 2.3. Frequency table of the number of unique injuries per student over the full academic year of 2016/2017.

A total of 254 unique injuries were reported by 105 students. Furthermore, 67 subsequent injuries were reported, resulting in a total of 321 reported injuries. The subsequent injuries were reported in at least two consecutive questionnaires and therefore did not calculate as a unique injury. The 105 students reported on average 2.0 unique injuries (range 1 – 7) during the academic year. As shown in Figure 2.3, 25 students (19.2%) did not report any injuries, 27 students (20.8%) reported one unique injury, 36 students (27.7%) reported two unique injuries and 42 students (32.3%) three or more unique injuries during the academic year.

A total of 132 906 dance exposure hours was reported during the academic year, resulting in an overall injury incidence rate of 1.9 unique injuries per 1,000 hours (95% CI = 1.7 to 2.2). The mean number of days a student completely/partly missed dance activities as a result of an unique injury was 5.7 days ± 10.8 (N = 252 students). The most reported anatomical injury locations were ankle/foot (including ankle, foot/toe, Achilles tendon and heel (N = 77, 30.3%)), lower back (incl. coccyx) (N = 44, 17.3%) and knee (N = 37, 14.6%).

Discussion

Using the PAHM which includes the OSTRC Questionnaire, we found a 1-year injury IP of 81% (N = 105) and an injury incidence rate of 1.9 unique injuries per 1,000 hours of dance exposure. Fifty-eight per cent (N = 61) of the injured students had a substantial injury, meaning that the students were not able to participate at all or had a moderate or severe reduction in training volume or performance because of an injury. The monthly IP for all injuries ranged from 23% to 43% and from 6% to 17% for substantial injuries. The injured students (N = 105) reported on average 2.0 unique injuries (range 1 – 7). The most reported anatomical injury locations were ankle/foot, lower back and knee.

Injury incidence and characteristics

Our findings of the 1-year injury IP of 81% extent those of other prospective cohort studies within dance. For instance, the study by Lee and colleagues (2017) showed a 1-year IP of 86% within ballet and contemporary dance students, and Kenny and colleagues (2018) reported a 1-year injury IP of 78% within contemporary dance students. Moreover, a recent systematic review of Kenny et al. (2016) indicated an injury IP range from 37% to 85% in pre-professional ballet and/or contemporary dancers within 20 follow-up studies, representing controlled trials, cohorts and a case-control research.

The injury incidence rate of the present study of 1.9 per 1,000 hours of dance exposure is in contrast to the injury incidence rate of 4.9 per 1,000 hours of dance exposure (95% CI = 4.10 to 5.79), reported in the prospective cohort study of Kenny et al (2018).

The difference may be explained by the different way of calculating the injury incidence rate. Kenny and colleagues used the total number of new injuries to calculate the incidence rate, resulting in the possibility of multiple injuries per week (up to four), whereas this study used the amount of unique injuries over one academic year, with a maximum of one injury (most severe) per month. Selecting all mentioned injuries in our dataset (including multiple injuries per month) led to a great injury incidence rate of 1.9-3.04 per 1,000 hours of dance exposure (95% CI 2.76 to 3.35). This higher injury incidence rate is still lower than the injury incidence rate mentioned by Kenny et al. (2018). However, both our injury incidence rates of 1.9 and 3.04 per 1,000 hours of dance exposure are in line with the range (0.77 – 4.71 per 1,000 hours of dance exposure) reported in the systematic review of Kenny and colleagues for pre-professional dancers (Kenny et al., 2016).

Within professional contemporary dancers, a lower injury incidence rate was reported; the study of Shah et al (2012) indicated a total of 0.59 injuries per 1,000 hours, and Bronner et al (2003) showed 0.51 injuries per 1,000 hours. However, these studies did not indicate whether they calculated their exposure rate based on the amount of time each dancer spent on stage or on the length of each show. The difference between dance students and professional dancers might also be attributed to the difference in experience and level. Dance students are still in a period of maturation and development (Bowerman et al., 2014; Lee et al., 2017). In the end, only the fittest (physically and mentally) dancers will remain and become professional dancers. Furthermore, as dancers age and gain experience they are likely to be more aware of the warning signs of injuries and take preventive steps (H. Thomas & Tarr, 2009).

To view our results in a wider perspective, we compared the injury incidence rate to other performing/sports populations with the same injury surveillance methodology and age group.

The injury incidence rate found in this study is (much) lower than found in circus arts students (3.3 injuries per 1,000 hours) (Stubbe et al., 2018), Dutch female gymnasts (5.2 injuries per 1,000 hours) (Richardson et al., 2017), and first-year Physical Education Teacher Education (PETE) students (11.7 injuries per 1,000 hours) (van Beijsterveldt et al., 2017). The difference might be explained by the differences in demands and environmental factors within these settings compared with our population. For example, PETE students participate in a wide range of different sports (including contact sports like soccer, rugby and so on) which causes them to have an increased risk of various injuries (Goossens et al., 2016).

In our study the most predominant injury locations were the ankle/foot (30%), lower back (15%) and the knee (14%). These results are in line with previous studies; the ankle/foot (21–34%), lower back (13–17%) and knee (12–21%) (Baker et al., 2010; Campoy et al., 2011; Lee et al., 2017; Shah et al., 2012).

Strengths, limitations and recommendations

A major strength of this study is the prospective design with monthly follow-up, resulting in a low potential for recall bias. Besides, the response rate to the monthly questionnaire was high (80%). This was achieved by incorporating the monitor as part of the educational programme. As recommended by Richardson and colleagues (2017), an online feedback tool (PAHM) (Stubbe et al., 2018) was used to give students visual feedback of the collected data to improve their commitment to this study. Furthermore, students were involved in the development of PAHM, by incorporating their feedback in the new versions of PAHM.

Another major strength of this study is the use of a broad injury definition and the surveillance method as suggested by Clarsen and colleagues to calculate the extent of injuries within contemporary dance students (Clarsen et al., 2013, 2014). The incidence and severity of injuries impacting dance students vary depending on the definition of injury and injury reporting methodology (Kenny et al., 2018). Therefore, to understand the full impact of injuries on a dance population, it is imperative that injury surveillance systems consider injury definitions that are sensitive enough to capture all injuries (Kenny et al., 2018), such as used in this study.

However, there are some limitations. First of all, in this study, we used student-reported outcomes. Since most students lack medicalexpertise we were unable to record specific diagnoses of the reported injuries. It is recommended to include a follow-up from the medical staff during the data collection period in future studies, to gain more insight into the injury type and aetiology.

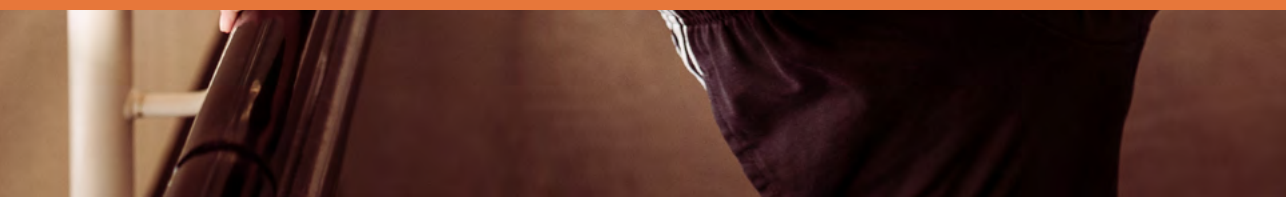
Furthermore, although our study indicated exposure by measuring the hours of dance classes, the intensity and nature of these classes were not included in the exposure analysis. However, these factors may have an impact on the potential injury risk for individual dancers (Campoy et al., 2011; Lee et al., 2017). In this study, dance exposure was calculated from the basic timetable for each year and educational programme but not individually and therefore may not truly reflect the actual hours of training or engagement by each individual student.

Non-scheduled dance practice, additional work-outs and performances were not included in the total number of hours of dance exposure. Future research should look more closely at the number of and rapid changes in training load, which can precede the onset of injury (Drew, 2015; Lee et al., 2017). Besides, it is necessary to gain insight into the variance within the monthly IPs of injuries in relation to the curriculum of the two educational programmes, to optimise the training load over the full academic year.

Chapter 3.

Characteristics and extent of mental health issues in contemporary dance students

van Winden, D., van Rijn, R. M., Savelsbergh, G. J. P., Oudejans, R. R. D., & Stubbe, J. H. (2020). Medical Problems of Performing Artists, 35(3), 121–129.



Abstract

Aims

This study investigated the extent and characteristics of mental health issues in contemporary dance students, as clear insight into these health problems is lacking.

Methods

During one academic year, 134 dance and dance-teacher students, were monitored on a monthly basis, using the Performing artist and Athlete Health Monitor (PAHM).

Results

In total, 130 students were included in the analyses, compromising 81 dance students and 49 dance-teacher students. The response rate of the monthly questionnaires was 79.7%. Overall, 96.9% of the students reported at least one physical/mental health problem. The incidence proportion (IP) of all reported mental health issues for one academic year was 44.6% (N = 58). Furthermore, 29.2% of the students reported a mental health issue as their most severe health problem, of whom 39.4% indicated a substantial mental health issue (i.e., problems leading to moderate, severe or complete reductions in training volume or performance). The monthly IP of mental health issues ranged from 2.9 to 8.9% and 0 to 5.3% for substantial mental health issues. The most reported types of mental health issues were general anxiety (20.0%), stress due to external factors (18.3%) and constant tiredness (16.7%). Dance-teacher students of all study years and second-year students from both educational programmes indicated significantly more mental health issues, while sex showed no significant differences.

Conclusions

Contemporary dance students are at risk of mental health issues. Dance schools should pay special attention to stress, anxiety and (constant) tiredness of their students. More research is needed to gain insight into specific characteristics and risk factors of mental health issues in dance students.

Introduction

Long hours of training, mostly combined with tight rehearsal and performance schedules resulting in insufficient recovery, are common among contemporary dance students (Grove et al., 2013; Kenny et al., 2016; Twitchett et al., 2010). Over time, these circumstances can lead to health problems such as injuries and mental health issues (Grove et al., 2013; Kenny et al., 2016). Mental health involves effective functioning in daily activities resulting in productive activities, healthy relationships and the ability to adapt to change and cope with adversity (American Psychiatric Association, 2018), whereas mental health issues result in difficulties with these aspects, such as concentration difficulties, low self-confidence, anxiety and stress.

Literature shows that dancers are at risk of mental health issues as a result of the high physiological and psychological demands of dancing and/or dance teaching (Grove et al., 2013; Laws & Apps, 2005; Wanke et al., 2015). Besides physical training stressors, additional psychosocial stressors in dance may likely influence dancers' mental and physical abilities to perform by increasing the demands placed on their bodies and influencing necessary recovery time (Grove et al., 2013).

Potential psychosocial stressors within dance are upcoming performances, relationships with choreographers, and maintaining ideal body weight (Mainwaring et al., 1993). Dancers are under substantial pressure to remain committed and dance through pain in order to pursue optimal performances (Grove et al., 2013). Furthermore, stressors can be found within environmental conditions (e.g., poor facilities and equipment), daily responsibilities (e.g., financial concerns), role/work-specific factors (e.g., perceived lack of autonomy and control, intra-group rivalry) and major life events (e.g., death of a loved one, serious injury) (Grove et al., 2013; Lepore & Evans, 1996). The way dancers appraise and cope with these stressors is a critical determinant to the impact on both their mental health and performance success (Lazarus, 2000). Mental health issues can result in persistent fatigue, performance decrements, feelings of reduced accomplishment, as well as devaluation and resentment of a previously enjoyable activity (Goodger et al., 2007; Grove et al., 2013).

Although mental health issues can lead to severe consequences, only one retrospective study has reported the incidence proportions of multiple mental health issues in contemporary dance students. Laws and Apps (2005) indicated that 92% of dancers experienced at least one mental health issue within one year. However, a few studies did look into specific mental health issues.

Among ballet students, 31.3% reported a history of disordered eating behaviours (J. J. Thomas et al., 2011), whereas 84.9% of ballet and contemporary dance students showed some perfectionistic tendencies (Nordin-Bates et al., 2011). Furthermore, students with greater perfectionistic tendencies (40.6%) experienced greater cognitive and somatic anxiety and lower self-confidence. Dancers scored much higher on posttraumatic stress disorder (PTSD) after a traumatic event, compared to the general population (25.4% vs. 8.7%) (Thomson & Jaque, 2016). Lastly, dance injuries were associated with higher levels of stress, anxiety, depression, anger, fatigue, confusion, sleep problems, and disordered eating (Adam et al., 2004; Mainwaring & Finney, 2017).

Within sports literature, further insights are available. Good mental health is seen as a necessary basis for efficient athletic performance (Schinke et al., 2018). Studies among various sports in France (mean age 18.5 ± 4.9 years) (Schaal et al., 2011) and Australia (mean age 24.91 ± 6.0 years) (Gulliver et al., 2015) have shown that 17 – 46.4% of athletes experienced symptoms of at least one mental health issue (recall period: 1 week to 6 months), whereas a study among Dutch athletes (mean age 27.3 ± 7.1 years) (Schuring et al., 2017) showed that 6–45% of athletes reported symptoms of common mental disorders (distress, anxiety/depression, sleep disturbance, eating disorders and adverse alcohol use) during a 4-week period. However, many researchers emphasise the importance of monitoring mental states and mental health status on a longitudinal basis to gain more insights into the extent of mental health issues, not only in sports (Schinke et al., 2018) but also within dance (Laws & Apps, 2005). A new surveillance method, the Oslo Sports Trauma Research Center Questionnaire on Health Problems (OSTRC-H Questionnaire), was designed to monitor health issues (Clarsen et al., 2013, 2014), and has previously been used within the performing arts (Kenny et al., 2019; Stubbe et al., 2018; van Seters et al., 2020; van Winden et al., 2019). This approach provides information on the actual consequences of health issues over time, such as the ability to participate in class activities/performances and any effects on the performance itself (Clarsen et al., 2013, 2014). The regular and systematic use of self-report instruments could enable an understanding into the mental health of dancers and provide valuable information for managing care, workloads and training environments (Grove et al., 2013; Nicholls & Polman, 2007; Rice et al., 2016). Therefore, the aim of this study was to establish the extent and characteristics of mental health issues in contemporary dance students using the surveillance method as suggested by Clarsen and colleagues (Clarsen et al., 2013, 2014). Furthermore, differences between sex, educational programme and study year were investigated.

Materials and Methods

Participants

A total of 134 first-year, second-year and third-year contemporary dance students (90 female and 44 male) were prospectively followed during one academic year (September 2016–June 2017). Students were enrolled in the four-year educational programme of either bachelor dance (e.g., dance students) or bachelor dance teacher (e.g., dance-teacher students) of Codarts Rotterdam, University of the Arts, the Netherlands. These programmes contain modern technique classes (such as Cunningham and Graham), ballet, contemporary, improvisation and partnering classes. Data were routinely collected as part of the curriculum for management and educational purposes. All students were informed about the procedure and provided written consent. Ethical approval for the study was provided by the Medical Ethics Committee Erasmus MC of Rotterdam, The Netherlands (MEC-2019-0163).

Procedures

During the first month of the academic year (September 2016), baseline characteristics were recorded, including age (years), height (centimetres), and mass (kilograms). During the academic year 2016/2017, all students were asked to complete monthly questionnaires by using the Performing artist and Athletes Health Monitor (PAHM) (Stubbe et al., 2018), a web-based system which includes a Dutch translation of the OSTRC-H Questionnaire on Health Problems (Clarsen et al., 2013; Richardson et al., 2017; Stubbe et al., 2018; van Seters et al., 2020; van Winden et al., 2019). The OSTRC-H Questionnaire has a high internal consistency, with a Cronbach's alpha of 0.96 and good face validity (Clarsen et al., 2013, 2014). Only students who completed >30% of the questionnaires were included in the analyses.

Mental Health Issue Registration

The OSTRC-H Questionnaire consists of four key questions about the consequences of health problems on participation, training volume, and performance as well as on the degree to which the student perceives any symptoms (Figure 3.1). All items ranged from 0 (no problem/ reduction/ effect or no symptoms) to 25 (cannot participate at all or severe symptoms) (Clarsen et al., 2013). The severity of a health problem was calculated by the sum score of the four questions (scale 0-100) (Clarsen et al., 2013). If the severity score was above zero, a health problem was registered and the student was asked whether the health problem was an injury, mental health issue or other health problem. For mental health issues, students were asked to specify the type of mental health issue they experienced based on a list previously used for dance students in the Netherlands (van Rossum, 2008) and United Kingdom (Laws & Apps, 2005) (Figure 3.1).

In case of several health problems during the same month, students were asked to refer to their 'most severe health problem' when answering the OSTRC-H questions (e.g., either one specific injury, one mental health issue or one other health problem). Additional health problems could be indicated at the end of the questionnaire. However, OSTRC-H severity scores of these additional health problems were not recorded.

1. Have you had any difficulties participating in class activities or performances due to health problems the past four weeks?

- ☐0 Full participation without health problems
- ☐8 Full participation, but with injury, illness or health problem
- ☐17 Reduced participation due to injury, illness or health problem
- ☐25 Cannot participate due to injury, illness or health problem.

2. To what extent have you reduced the volume of your class activities or performances due to health problems the past four weeks?

- ☐0 No reduction
- ☐6 To a minor extent
- ☐13 To a moderate extent
- ☐19 To a major extent
- ☐25 Cannot participate at all

3. To what extent has your health problem affected your performance the past four weeks?

- ☐0 No effect
- ☐6 To a minor effect
- ☐13 To a moderate effect
- ☐19 To a major effect
- ☐25 Cannot participate at all

4. To what extent have you experienced health complaints the past four weeks?

- ☐0 No health complaints
- ☐8 To a mild extent
- ☐17 To a moderate extent
- ☐25 To a severe extent

In case of a severity score above zero on question 1,2, 3 or 4 the following question was asked:

5. Is the health problem referred to in the previous questions an injury, illness, mental complaints or anything else?

- ☐ Injury
- ☐ Mental complaint
- ☐ Illness
- ☐ Other complaints (for example accidents, operation et cetera): ……

In case of a mental complaint the following questions were asked:

Which mental complaints did you experienced since the previous questionnaire? If several mental complaints occurred, please refer to the <u>most severe</u> one in the past four weeks. Other complaints can be given later.

- ☐ General anxiety
- ☐ Tension with people
- ☐ Performance anxiety
- ☐ Depression
- ☐ Stress due to external factors; e.g., bereavement (death of a beloved one), moving house
- ☐ Eating problems
- ☐ Alcohol or drugs abuse
- ☐ General low self-confidence
- ☐ Sudden drop in self-confidence
- ☐ Consistent difficulty in concentrating in class or rehearsal
- ☐ Constant tiredness
- ☐ Burn-out
- ☐ Feeling under pressure
- ☐ Other, namely ……

Have you experienced any (other) mental complaints in the past four weeks?

- ☐ No
- ☐ Yes

Which (other) mental complaints did you experienced in the past four weeks?

- ☐ General anxiety
- ☐ Tension with people
- ☐ Performance anxiety
- ☐ Depression
- ☐ Stress due to external factors; e.g., bereavement (death of a beloved one), moving house
- ☐ Eating problems
- ☐ Alcohol or drugs abuse
- ☐ General low self-confidence
- ☐ Sudden drop in self-confidence
- ☐ Consistent difficulty in concentrating in class or rehearsal
- ☐ Constant tiredness
- ☐ Burn-out
- ☐ Feeling under pressure
- ☐ Other, namely ……

Figure 3.1. Questions of the Performing artist and Athletes Health Monitor (PAHM) focusing on mental health issues, including the four key questions of OSTRC-H Questionnaire on Health Problems.

Mental Health Issue Definitions

All reported mental health issues were the mental health issues appointed as the 'most severe health problem' using the OSTRC-H Questionnaire combined with the additional mental health issues indicated by the students at the end of the questionnaire, resulting in the possibility of multiple mental health issues per student per month. A mental health issue reported as the most severe health problem was defined as any mental complaint sustained by a dancer resulting in a severity score higher than zero on the OSTRC-H Questionnaire (i.e., leading to consequences on participation, training volume, and/or performance). Students were characterised as having a substantial mental health issue if they reported mental health issues leading to moderate or severe reductions in training volume (value ≥13 on question 2 of the OSTRC-H) or moderate, severe, or complete reductions in performance (value ≥13 on question 3 of the OSTRC-H) (Clarsen et al., 2014). Furthermore, if a student reported the same mental health issue as their most severe health problem in two or more consecutive questionnaires, this was counted as one 'unique' case of a (fluctuating) mental health issue (Stubbe et al., 2018).

Statistical analysis

All statistical procedures were performed using SPSS V.23 (IBM, Armonk, USA). Descriptive statistics were used to describe baseline characteristics using means and standard deviations (SD) or numbers and percentages (%). The incidence proportion (IP) of all reported mental health issues and (substantial) mental health issues as the most severe health problem for one academic year and per month was calculated by dividing the number of students that, respectively, reported at least one mental health issue or one (substantial) mental health issue as their most severe health problem during the academic year/month by the number of respondents in that same period (Knowles et al., 2006). The severity of unique mental health issues was calculated by the mean SD of the number of full days that a student partly/completely missed their dance activities due to their mental health issue. Characteristics (i.e., type of mental health issue) were expressed in percentages for the total of unique mental health issues. To evaluate differences between groups (e.g., sex, educational programme and study year), Pearson chi-square ($\chi 2$) tests were used, $p < 0.05$.

Results

Response and Baseline Characteristics

Baseline characteristics of all students are shown in Table 3.1. In total, 137 students were enrolled in the educational programmes, 134 students gave consent to participate, and 130 students were included in the analyses. The 4 excluded students, with a response rate <30%, dropped out of the educational programme within 4 months, two of them due to mental health issues.

Table 3.1. Baseline Characteristics

	Overall
N	134
Education programme Dance	84 (62.7%)
Education programme Dance Teacher	50 (37.3%)
First year students	49 (36.6%)
Second year students	44 (32.8%)
Third year students	41 (30.6%)
Sex (female)	90 (67.2%)
Age (years)	19.4 ± 1.5
BMI	21.0 ± 1.8

In total, 1,279 questionnaires were sent to the students and 1,020 were completed, resulting in a response rate of monthly questionnaires of 79.7%.

Health Problems

During the academic year, 96.9% (N = 126) of the students reported at least one health problem (injury, mental health issue, or other health problem). Of these students, 64.3% (N = 81) reported a substantial health problem, meaning that they had moderate, severe or complete reduction in training volume or performance because of their health problem.

In total, 300 mental health issues were reported by 58 students, resulting in an IP of all reported mental health issues for one academic year of 44.6% (Figure 3.2). The monthly IP of all reported mental health issues ranged from 9.7 to 21.8%. The most commonly reported mental health issues were depression (IP 18.5%), constant tiredness (IP 18.5%) and stress due to external factors (IP 17.7%).

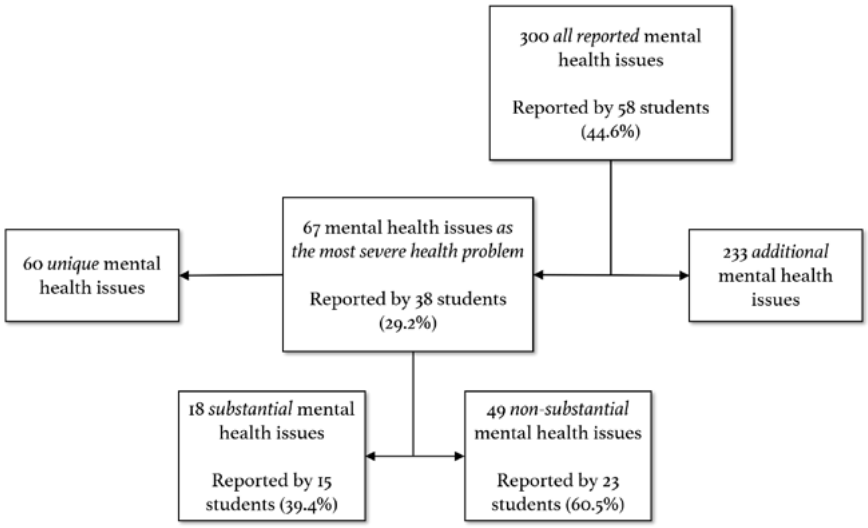


Figure 3.2. Number and IP of all mental health issues during the full academic year of 2016/2017.

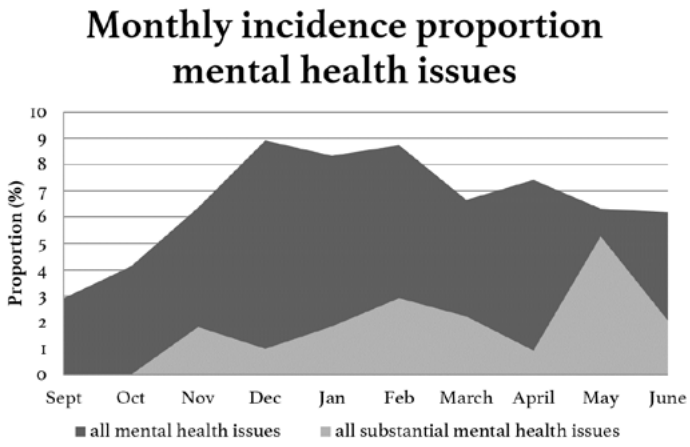


Figure 3.3. Monthly IP of all and substantial mental health issues as most severe health problem during the full academic year of 2016/2017.

Incidence of Mental Health Issues as the Most Severe Health Problem

Results show that 29.2% (N = 38) of the students reported 67 mental health issues as their most severe health problem during the full academic year. Of these students, 39.4% (N = 15) indicated their mental health issue as a substantial problem (Figure 3.2) leading to consequences for participation, training volume, and/or performance.

The monthly IP of mental health issues characterized as the most severe health problem ranged from 2.9 to 8.9%, and from 0 to 5.3% for substantial mental health issues (Figure 3.3). In the months September and October, no substantial mental health issues were reported. The mean monthly OSTRC-H severity score of mental health issues was 26.1 (SD 8.4) and for substantial mental health issues 56.2 (SD 15.8), calculated over the remaining eight months (November to June, Figure 3.4).

Incidence of Unique Mental Health Issues

Overall, 38 students reported a total of 60 'unique' mental health issues. Seven subsequent mental health issues were reported, resulting in a total of 67 reported mental health issues. The subsequent mental health issues were reported in at least two consecutive questionnaires and therefore did not present as a unique mental health issue. The 38 students reported on average 1.6 unique mental health issues (range 1 – 3) during the academic year. 92 students (70.8%) did not report any mental health issues as the most severe health problem, 23 students (17.7%) reported one unique mental health issue and 15 students (11.5%) reported two or more unique mental health issues during the academic year.

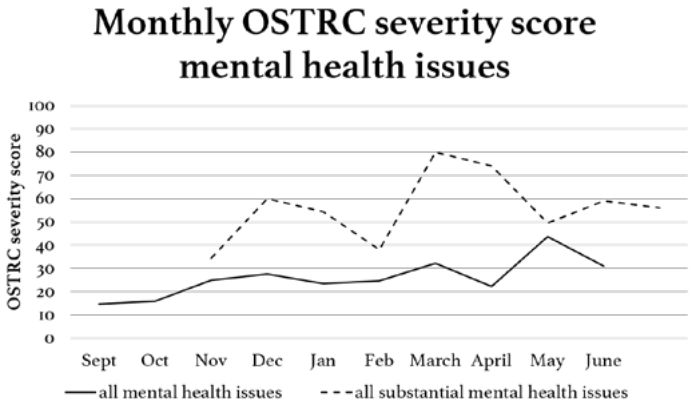


Figure 3.4. Mean monthly OSTRC-H severity scores of all and substantial mental health issues as most severe health problem during the full academic year of 2016/2017.

The mean number of days that a student partly/completely missed dance activities as a result of a unique mental health issue was 3.0 ± 5.8 days (N = 59 students). The most reported unique mental health issues were general anxiety (N = 12, 20.0%), stress due to external factors (N = 11, 18.3%) and constant tiredness (N = 10, 16.7%).

Differences in Mental Health Issues between groups

No differences were found between sex, while dance-teacher students indicated significantly more mental health issues compared to dance students – IP of all reported mental health issues: $\chi 2 = 5.0$ (df = 1), p = 0.025; IP of mental health issues as the most severe health problem: $\chi 2 = 9.332$ (df = 1), p = 0.002; IP of substantial mental health issues: $\chi 2 = 3{,}593$ (df = 1), p = 0.058 (Table 3.2). When comparing first-, second- and third-study year of both educational programmes, only substantial mental health problems showed significant results – ($\chi 2 = 7.04$ (df = 2), p = 0.03) – showing that second-year students indicated more mental health issues than first- and third-year students.

Table 3.2. Differences in Incidence Proportions (IP) of Mental Health Issues Between Groups.

	Educational programme		Sex		Study year		
	Dance	Dance Teacher	Male	Female	First	Second	Third
N	81	49	41	89	49	44	41
IP_all	37.04%	57.14%*	39.02%	47.19%	52.08%	46.34%	34.14%
IP_severe	19.75%	44.90%**	21.95%	32.58%	37.50%	31.71%	24.39%
IP_substantial	37.50%	40.91% †	44.45%	37.93%	13.33%	69.23%	40%*

IP_all: IP of all reported mental health issues; IP_severe: IP of mental health issues as the most severe health problem; IP_substantial: IP of substantial mental health issues.
* significant at p < 0.05, ** significant at p < 0.01. † trend: p = 0.058.

Discussion

The aim of this study was to investigate the extent and characteristics of mental health issues in contemporary dance students. Using the web-based system PAHM, with the OSTRC-H Questionnaire, we found a 1-year IP of all reported mental health issues of 44.6% (N = 58) and a monthly IP of 9.7 to 21.8%. Moreover, 29.2% of the students (N = 38) reported a mental health issue as their most severe health problem, and 39.4% (N = 15) of these students had a substantial mental health issue, meaning that they had moderate, severe, or complete reduction in training volume or performance because of their mental health issue. The monthly IP for mental health issues as the most severe health problem ranged from 2.9 to 8.9% and 0 to 5.3% for substantial mental health issues. Furthermore, 38 students reported 1.6 unique mental health issues on average (range 1 – 3). The most reported types of unique mental health issues were general anxiety, stress due to external factors and constant tiredness.

In the first two months of the academic year (September and October), no substantial mental health issues were reported. A possible explanation could be that students start the academic year more refreshed and fit after a 2-month summer break. Adequate recovery is essential to prevent chronic health problems (Grove et al., 2013).

Mental detachment (a sense of being away from performance-related thoughts, emotions, and feelings during time off) has been positively linked to health and well-being within dance students (Balk et al., 2018). Sex showed no significant differences, while second-year students indicated more substantial mental health issues. Dance-teacher students indicated significantly more mental health issues compared to dance students. Each study year and educational programme consist of the same amount of workload (1,680 study-hours, including preparation, classes, and tests); however, the ratio physical-theoretical classes differs. The bachelor dance curriculum contains 75% physical classes, whereas the bachelor dance-teacher contains 50% physical and 50% theoretical classes. Dance students had an average total dance exposure of 1,267.5 hours for a full academic year, while dance-teacher students had an average total of 825.5 hours.However, dance-teacher students might want to stay involved in performances besides the opportunities within their school, as this will add to their dance experience (Balk et al., 2018), increasing their workload besides the regular school load. Previous research has shown that sensory and affective perception of pain was more pronounced in dance teachers than in dancers on the semi- or non-professional level (Lampe et al., 2019).

Although this study focused on physical pain, a similar phenomenon could be present when looking into mental health issues. However, more research is needed before (firm) conclusions can be drawn. To gain more insight in the differences between study year, longer follow-up periods of a full education per student are needed.

Laws and Apps (2005) indicated that 92% of dancers experienced at least one mental health issue within one year, much higher than the 1-year IP of 45% in the current study. The difference could be explained by the retrospective design used by Laws and Apps with separate questions for mental health issues and injuries, whereas this study used a prospective design and students were asked to point out their most severe health problem regardless of the nature (e.g., either physical injury, mental health issue or other health problem). However, they did have the option to indicate additional health problems that they experienced during that monthly period. Although the same answer options were used, the distribution of mental health issues differed. In the present study, general anxiety (20.0%), stress due to external factors (18.3%) and constant tiredness (16.7%) were the most reported types of unique mental health issues. In the Laws and Apps study (2005), the most reported types were tension with people (62%), constant tiredness (60%) and general low self-confidence (58%). This could be explained by the differences in study population. The current study was focused on contemporary dance students, whereas Laws and Apps (2005) included professional dancers and dance students of various dance styles (e.g., ballet, jazz, modern, musical theatre), resulting in a more diverse population. Different dance styles, environments and levels can result in different pressures and other types of mental health issues (Laws & Apps, 2005).

Due to the limited research and reported incidences on mental health issues within dance we compared our results to similar age groups of students and athletes. However, most sport-related studies are conducted on a retrospective or single-point basis and among older athletes. One study among French athletes showed similarities with the present results (Schaal et al., 2011). The reported IP (within the last 6 months) of anxiety of 8.6% lies between the current monthly and 1-year IP (3.85–16.2%), just as the reported IP of eating problems of 4.9% (vs. 2.4–10.0% in this study). Differences were shown for alcohol and drugs abuse, with no problems in our study group versus a range of 0.4 to 20.9% among the French athletes. The IP for depression was higher in this dance population (3.7–18.46% vs. 3.6%). Additionally, Auerbach and colleagues (2018) indicated a 1-year IP of common mental health disorders (e.g., anxiety/panic, mania/depression and alcohol/substance abuse) of 31% among college students across different countries.

The present 1-year IP of these mental health issues was 29%, comparable to previous literature among college students and athletes.

However, very different methods were used in previous research compared to this study, making direct comparisons difficult. The current study used a prospective design, whereas other studies showed IP based on current common mental disorders using different questionnaires. Furthermore, a recent systematic review within the sport population showed a tendency for higher vulnerability to specific types of mental health issues (such as eating disorders and body image concerns) in sports requiring a particular body shape and in female athletes (Rice et al., 2016). Women were 1.3 times more likely to be diagnosed with at least one common mental disorder (Schaal et al., 2011). Additionally, within aesthetic sports, significantly higher lifetime prevalence of anxiety disorders, depression and sleep problems were found (Schaal et al., 2011). As the current dance population consisted of more women (67%) and aesthetic characteristics are very important in dance, a higher IP could be expected within this study. Possibly, the results of the present study are an underrepresentation of the actual number of mental health issues, due to the specific method and design used.

Factors that could influence the risk of sustaining a mental health issue, and therefore the IP, besides sex, are physical health status (i.e., being injured) or experiencing performance difficulty (Rice et al., 2016). Future research should therefore take these factors into account while looking at the incidence and characteristics of mental health issues.

Furthermore, insight into the variance within the monthly IP of mental health issues in relation to the curriculum can provide more detailed guidance for dance practitioners (including management, teachers and medical staff) and, in turn, optimise performance potential, while protecting the dancers' physical and mental health (Grove et al., 2013; Nicholls & Polman, 2007; Rice et al., 2016).

Strengths, Limitations and Recommendations

A major strength of this study is that a prospective design with monthly follow-ups and a high response rate (79.7%) was used to report on IP of mental health issues within contemporary dance students. This was achieved by incorporating the monitor as part of the educational programme. As recommended by Richardson and colleagues (2017), an online feedback tool, PAHM (Stubbe et al., 2018), was used for visual feedback of the collected data to improve their commitment to this study.

However, there are some limitations. First of all, students had to choose which (mental) health issue they perceived as their most severe health problem. However, problems often coexist. Dance injuries may be associated with a diverse range of mental health issues (Adam et al., 2004; Mainwaring & Finney, 2017), in which case injuries are expected to be mentioned as most severe health problem, since injuries and their consequences are more visual. Our results show that 22% of all the students reported a mental health issue after indicating an injury as the most severe health problem, while 7% reported an injury after indicating a mental health issue as the most severe health problem. Furthermore, mental health issues often appear simultaneously, therefore making it hard for students to address them separately. Symptoms of distress, anxiety, depression or substance abuse/dependence are often comorbid (Gouttebarge et al., 2017). Laws and Apps (2005) reported that 85% of the dancers experienced more than one mental health complaint. Therefore, the IP of mental health issues as the most severe health problem and the severity score of these mental health issues could be an underestimation. However, students were able to indicate other mental health issues later in the questionnaire, resulting in the IP of all reported mental health issues.

Second, only OSTRC-H severity scores from mental health issues registered as the most severe health problem were recorded. As a result, it was not possible to indicate whether the additional health problems were substantial or not. Furthermore, in this study a previously developed list of mental problems was used (Laws & Apps, 2005; van Rossum, 2008). However, the range of mental problems is very broad and almost impossible to capture in a single list. Within the sports literature, differ¬ent questionnaires were used, which makes comparing results more difficult. However, an open option was avail¬able where students could indicate problems that were not listed. Most additional reported problems were later recoded into the existing options, except specific problems (such as school assignments and family situations), home sickness, and stress. Future studies including this list of mental problems should consider including home sickness and general or dance-related stress as specific options.

Finally, the mental health issues were measured through self-report, which produced subjective data and a lack of detailed diagnostic information. To gain more insight into specific mental health illnesses, we recommend the inclusion of a follow-up from the medical staff (e.g., clinical psychologist) during the data collection period in future studies. While interpreting the current results, it is important to keep in mind the heightened stigma around mental health.

The fear of being excluded as result of mental ill-being is shown in sports (Bauman, 2016) and can result in lower self-reported incidence. While the current studied population did not report any alcohol/drugs abuse, on average 6% of college students indicate a substance use disorder within one year (Auerbach et al., 2018), and in sports rates vary between 6 and 23% over a period of 4 weeks (Gouttebarge et al., 2016, 2017). In order to reduce the potential of social desirability, results from the questionnaires were anonymously analysed and not shared on individual level with the students' teachers in this study.

Conclusion and Practical Implications

This study examined the extent and characteristics of mental health issues in contemporary dance students, as clear insights into these health problems is lacking. The results of this prospective study indicate that contemporary dance students are at high risk for mental health issues; almost 45% of the students suffered from at least one mental health issue during the academic year. We used an online monitoring tool (PAHM) containing the OSTRC-H Questionnaire on Health Problems (Stubbe et al., 2018), which has not been previously applied to mental health issues. The results show that almost 30% of dance students reported a mental health issue as their most severe health problem. Of these students, almost 40% had a substantial mental health issue, meaning that they had moderate, severe, or complete reduction in training volume or performance. The most reported mental health issues were general anxiety, stress due to external factors, and constant tiredness.

The current study offers important clinical and practical implications regarding the need for contemporary dance schools increase the focus on mental health and well-being. Dance schools should pay special attention to stress, anxiety, and (constant) tiredness of their students, among other mental health issues. Focusing on mental health can enable help-seeking behaviours and promote the prevention and effective treatment of the processes that hinder well-being in performance, personal, and interpersonal domains (Henriksen et al., 2019; Moesch et al., 2018; Schinke et al., 2018). Schools should therefore be encouraged to recognize the need for mental health literacy and provide relevant educational resources (Henriksen et al., 2019; Schinke et al., 2018), for instance by providing workshops or lectures about dealing with anxiety/stress within dance by renowned (sport) psychologists. However, more research is needed to gain insight into the specific characteristics and risk factors for the occurrence of mental health issues in dance students.

Appendix

Mental health definitions

Terminology	Definition
All reported mental health issues	Any mental complaint sustained by a dancer, consisting of the mental health issues appointed as the 'most severe health problem' using the OSTRC-H Questionnaire combined with the additional mental health issues indicated by the students at the end of the questionnaire, resulting in the possibility of multiple mental health issues per student per month.
Mental health issues as the most severe health problem	Any mental complaint sustained by a dancer resulting in a severity score on the OSTRC-H Questionnaire higher than zero (i.e., leading to consequences on participation, training volume, and/or performance). In case of several health problems during the same month, students were asked to refer to their 'most severe health problem' when answering the OSTRC-H questions (e.g., either one specific injury, one mental health issue or one other health problem).
Substantial mental health issues	Mental health issues leading to moderate or severe reductions in training volume (value ≥13 on question 2 of the OSTRC-H) or moderate, severe or complete reductions in performance (value ≥13 on question 3 of the OSTRC-H), e.g., mental health issues reported as the most severe health problem with values ≥13 on question 2 and/or 3 of the OSTRC-H.
'unique' mental health issues	The same mental health issue as the most severe health problem reported in two or more consecutive questionnaires.

Chapter 4.

Limited coping skills, young age, and high BMI are risk factors for injuries in contemporary dance: a 1-year prospective study

van Winden, D., van Rijn, R. M., Savelsbergh, G. J. P., Oudejans, R. R. D., & Stubbe, J. H. (2020). Frontiers in Psychology, 11, 1452.

Abstract

This study investigated potential risk factors (coping, perfectionism, and self-regulation) for substantial injuries in contemporary dance students using a prospective cohort design, as high-quality studies focusing on mental risk factors for dance injuries are lacking. Student characteristics (age, sex, BMI, educational programme, and history of injury) and psychological constructs (coping, perfectionism, and self-regulation) were assessed using the Performing artist and Athlete Health Monitor (PAHM), a webbased system. Substantial injuries were measured with the Oslo Sports Trauma Research Center (OSTRC) Questionnaire on Health Problems and recorded on a monthly basis as part of the PAHM system. Univariate and multivariate logistic regression analyses were conducted to test the associations between potential risk factors (i.e., student characteristics and psychological constructs) and substantial injuries. Ninety-nine students were included in the analyses. During the academic year 2016/2017, 48 students (48.5%) reported at least one substantial injury. Of all factors included, coping skills (OR: 0.91; 95% CI: 0.84–0.98), age (OR: 0.67; 95% CI: 0.46–0.98), and BMI (OR: 1.38; 95% CI: 1.05–1.80) were identified as significant risk factors in the multivariate analysis. The model explained 24% of the variance in the substantial injury group. Further prospective research into mental risk factors for dance injuries with larger sample sizes is needed to develop preventive strategies. Yet, dance schools could consider including coping skills training as part of injury prevention programmes and, perhaps, providing special attention to younger dancers and those with a higher BMI through transitional programmes to assist them in managing the stress they experience throughout their (academic) career.

Introduction

Dancers are high-performance athletes who are highly vulnerable to sustaining an injury (Ramkumar et al., 2016), which can have severe consequences, such as required medical treatment, experienced discomfort, decreased health-related quality of life, restricted artistic development due to absence from dance activities, and a significant delay in studying (Kenny et al., 2016; White et al., 2018; Yau et al., 2017). Previous literature showed prevalence and incidence rates of injuries among pre-professional ballet, modern and contemporary dancers ranging from 37 to 86% and from 0.77 to 4.71 injuries per 1,000 hours of dance (Kenny et al., 2016; Lee et al., 2017; van Winden et al., 2019).

Insight into the aetiology and mechanisms of injuries is of great importance to develop preventive measures and assess their effectiveness (Finch, 2006; van Mechelen et al., 1992). However, previous studies aiming at identifying risk factors for ballet and modern dance injuries have shown little consistence due to a lack of quality andlevel of evidence (Kenny et al., 2016). Moreover, dance medicine and science has traditionally focused on the physical aspects of injuries (Krasnow et al., 1999; Liederbach & Compagno, 2001; Mainwaring & Finney, 2017), while studies including dancers and athletes have shown that psychological constructs might also influence the occurrence of (dance) injuries and affect injury outcomes, including successful rehabilitation, duration of injury, and treatment-seeking behaviour (Mainwaring & Finney, 2017; Reardon et al., 2019). Furthermore, mental skills can be considered adaptable (Kenny et al., 2016), which makes them appropriate for preventive measures.

The stress-and-injury model of Williams and Andersen (1998) suggests that psychosocial factors, namely, coping resources, personality, and history of stressors, influence the stress response and, in consequence, the probability of injury occurrence. More recently, the International Olympic Committee indicated in their consensus statement that limited coping resources and perfectionism are mental risk factors for injuries in sports (Reardon et al., 2019). Coping resources may help individuals to identify fewer situations and events as stressful, protecting them from stress and injuries (Williams & Andersen, 1998), whereas perfectionism can lead to increased stress levels, since performances are often viewed as an opportunity to fail rather than to succeed (Krasnow et al., 1999; Madigan et al., 2018).

Within ballet, there is some evidence that limited coping skills are associated with an increased injury risk (Noh et al., 2005). A quasi-experimental study showed that young ballet dancers who learned broad-based coping skills sustained less injuries and less severe injuries (i.e., shorter duration) compared with dancers who had not learned these skills (Noh et al., 2007).

Furthermore, it is frequently believed that dancers are perfectionists (Nordin-Bates et al., 2011). Research has shown that injured ballet dancers scored significantly higher on perfectionism scales than non-injured dancers (Liederbach & Compagno, 2001). In addition, a study among modern and ballet dancers showed significant associations between perfectionism (i.e., high parental expectations, concern over mistakes) and injuries (Krasnow et al., 1999). However, these studies did not indicate the direction of the association or the causality due to methodological limitations, implying it is still unclear whether perfectionism can be seen as a risk factor for injuries in dance.

Furthermore, a recent study showed that high levels of self-regulatory skills (i.e., self-monitoring skills) can possibly help tennis players to prevent injury (van der Sluis et al., 2019). For instance, athletes/dancers could possibly prevent overuse symptoms from becoming time-loss injuries through the use of self-monitoring. However, to our knowledge, no study has investigated the relationship between self-regulation and injuries within a dance population.

Insight into risk factors for injuries enables us to develop preventive injury measures, which is of great importance considering the high frequency and disadvantageous consequences of injuries in dance. Furthermore, Kenny et al. (2016) stated that high-quality prospective cohort methods and multivariate regression modelling are needed within dance research to address causality, potential effect modification, and confounding factors. Therefore, the aim of this study is to establish whether psychological constructs (i.e., coping, perfectionism, and self-regulation) are potential risk factors for injuries in contemporary dance students. We hypothesized that limited coping skills, high perfectionism scores, and low self-regulation abilities would result in a higher risk of sustaining a substantial injury.

Materials and methods

Participants

During a full academic year (September 2016–June 2017), 107 first year, second year, and third year contemporary dance students were prospectively followed. Students followed a 4-year educational programme of either Bachelor dance or Bachelor dance teacher of Codarts Rotterdam, University of the Arts, the Netherlands. These programmes contain modern technique classes (such as Cunningham and Graham), ballet classes, and contemporary classes (such as improvisation and partnering). Data was collected on a regular basis for management and educational purposes and embedded in the curriculum. Previously published longitudinal studies (van Winden et al., 2019, 2020a), investigating the amount and characteristics of injuries and mental health problems, respectively, are (partly) based on the same sample. The present study utilizes a novel method, an analysis of potential psychological risk factors on the occurrence of dance injuries, which provides new interpretations of this data. All students were informed about the procedure and provided written consent in accordance with the Declaration of Helsinki. Ethical approval for the study was provided by the Medical Ethics Committee Erasmus MC of Rotterdam, the Netherlands (MEC-2019-0163). A priori power estimation has not been performed, since a pre-existing single cohort was available for this study.

Measures

Student characteristics (age, sex, BMI, educational programme, and history of injury), injuries and psychological constructs were assessed using the Performing artist and Athletes Health Monitor (PAHM) (Stubbe et al., 2018), a web-based system consisting of an extensive intake and a monthly follow-up, which includes the Oslo Sports Trauma Research Center (OSTRC) Questionnaire on Health Problems (Clarsen et al., 2014). This questionnaire has previously been used within performing arts (Stubbe et al., 2018; van Seters et al., 2020; van Winden et al., 2019).

Injury Registration

The OSTRC Questionnaire focuses on the consequences of health problems on participation, training volume, and performance along with the degree to which students perceive any symptoms. The four key items range from 0 (no problem/reduction/effect or no symptoms) to 25 (cannot participate at all or severe symptoms) (Clarsen et al., 2013). Questions 1 and 4 are scored on a four-point scale (0–8–17–25), while questions 2 and 3 are scored on a five-point scale (0–6–13–19–25). The OSTRC Questionnaire has a high internal consistency, with a Cronbach's alpha of 0.96 and good face validity (Clarsen et al., 2013, 2014).

The severity of a health problem was calculated by the sum score of the four questions (scale 0–100) according to the method proposed by Clarsen et al. (2013). A health problem was registered when the severity score was higher than zero. The student was then asked whether the health problem was an injury, mental complaint, illness, or other complaint.
An injury was defined as "any physical complaint sustained by a dancer resulting in a severity score higher than zero (i.e., leading to consequences on participation, training volume, and/or performance), irrespective of the need for medical attention or time-loss from dance activities" (van Winden et al., 2019). Students were characterized as substantially injured if they reported problems leading to moderate or severe reductions in training volume (value ≥13 on question 2 of the OSTRC Questionnaire) or moderate, severe, or complete reductions in performance (value ≥13 on question 3 of the OSTRC Questionnaire) (Clarsen et al., 2014). Risk analyses were performed on substantial injuries, due to the more severe consequences and impact of these injuries on dance participation. Furthermore, preliminary results showed that less than 20% of the students were completely injury-free during the academic year, which would result in a very small reference group when all injuries were used as a dependent variable.

Psychological Constructs
The Athletic Coping Skills Inventory–28 (ACSI-28) (R. E. Smith et al., 1995) was used to measure general coping skills. The ACSI is a 28-item inventory of seven subscales: coping with adversity, coachability, concentration, confidence and achievement motivation, goal setting and mental preparation, peaking under pressure, and freedom from worry. The items are scored on a four-point Likert scale, ranging from 0 (almost never) to 3 (almost always). Total sum scores were calculated ranging from 0 to 84, with higher scores indicating greater coping skills. The ACSI has a test–retest reliability of 0.87 and a Cronbach alpha of 0.86 (R. E. Smith et al., 1995). The questionnaire was adjusted for the dance students, by replacing "coach or manager" with "teacher," "competition" with "performance," and "sports" with "perform".

The dance-specific Perfectionism Inventory (Nordin-Bates et al., 2011) was used to measure perfectionism. This questionnaire is based on the Perfectionism Inventory (PI) of Hill et al. (2004), which was developed to include the multidimensional aspects of perfectionism within individuals in their daily lives. The dance-specific PI consists of seven scales: planfulness, striving for excellence, high standards for others, rumination, need for approval, concern over mistakes, and parental pressure.The first three subscales constitute the factor "conscientious perfectionism," while the latter four result into the factor "self-evaluative perfectionism".

All items are rated on a Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The dance-specific PI contains 51 items, with an internal reliability per subscale (Cronbach's alpha values) ranging from 0.74 to 0.89 (Nordin-Bates et al., 2011).

Students completed the short version of the Self-Regulation Questionnaire (SSRQ) (Carey et al., 2004) to assess their capacity for self-regulation; that is, the ability to plan, guide, and monitor behaviours in the face of changing circumstances (Miller & Brown, 1991). The SSRQ is a 31-item questionnaire scored on a five-point Likert scale ranging from strongly disagree (1) to strongly agree (5). Sum scores were calculated, with higher scores indicating higher self-regulation capacity (Neal & Carey, 2005). The SSRQ has a Cronbach alpha of 0.92 and high correlation with the full-length SRQ (r = 0.96) (Carey et al., 2004; Hustad et al., 2009; Neal & Carey, 2005).

Procedures

During the first month of the academic year (September 2016), baseline characteristics were recorded including age (years), body mass index [BMI; kg/m2, calculated from height (centimetres) and body weight (kilograms)], history of injury, coping, perfectionism, and self-regulation using the PAHM system. Injury history was defined as "any physical complaint resulting in a fulltime loss of dance activities (participation in class, rehearsal, performance practice, etc.) for at least one week beyond the day of onset in the past year" (van Seters et al., 2020), in accordance with the Fuller consensus statement (Fuller et al., 2006). Furthermore, during the academic year 2016/2017, injuries were recorded on a monthly basis. Only dance students who were injury-free at baseline and who completed >30% of the monthly questionnaires were included in the analyses.

Statistical Analyses

Statistical analyses were performed using SPSS V.25 (IBM, Armonk, USA), and statistical significance level was set at an alpha level of 0.05. Baseline characteristics were described using descriptive statistics, namely, mean and standard deviation (SD) or number and percentage (%). The incidence proportion of all injuries and substantial injuries was calculated by dividing the number of students that reported at least one injury or substantial injury during the academic year by the number of respondents in that same period (Knowles et al., 2006).

Univariate and multivariate regression models were used in order to look at potential injury risk factors. In addition to psychological constructs, student characteristics were taken into account, as a biopsychosocial approach toward injury risk management is desirable (Wiese-Bjornstal, 2010).

Potential risk factors included age (years), sex (male), BMI (kg/m2), educational programme (Bachelor dance teacher vs. Bachelor dance), and injury history in the previous year. Furthermore, the total coping score of the ACSI-28, the mean "conscientious perfectionism" and "self-evaluative perfectionism" factor scores of the dance-specific PI, and the total self-regulation score of the SSRQ were taken into account in the regression models. First, univariate logistic regression analyses between the potential risk factors and substantial injury (yes/no) were assessed to determine the relationship of each independent variable with the outcome variable. Second, all variables were included in a multivariate logistic regression model (method = enter). The results of the regression analyses for each potential risk factor were expressed in odds ratios (ORs) with corresponding 95% confidence interval (95% CI). Goodness-of-fit of the multivariate regression model was expressed in the Pearson chi-square statistic¬ $\chi 2$, and the Nagelkerke R2 value was used to express the proportion of variance that was explained by the model (Field, 2009).

A total of 76 students (76.8%) provided complete data on all intake questionnaires (ACSI-28: 9 missing items; 0.33%, PI: 18 missing items; 0.36%, and SSRQ: 7 missing items; 0.26%), and 9 students had missing BMI scores (9.1%). Instead of relying on complete case analyses, multiple imputation via SPSS was used in order to increase the sample size (from N = 70 complete cases to N = 99). Only missing individual items within each questionnaire, as opposed to total scores, were imputed, as advised by Eekhout et al. (2014). Five imputed datasets were generated by SPSS, as recommended to be sufficient on theoretical grounds (Sterne et al., 2009). These five datasets were combined into one single set of pooled results for the regression analyses by SPSS. After data imputation, complete data was available for all 99 students on every measure.

Results

Response and Baseline Characteristics

A total of 137 students were enrolled in either the Bachelor dance or Bachelor dance teacher educational programme, 134 students agreed to participate, and eventually the analyses were performed on 99 students (mean age: 19.2 ± 1.5 years). Twenty-seven students were excluded due to missing intake questionnaires, one student did not meet the inclusion criteria of a response rate higher than 30% on the monthly follow-up questionnaires due to dropping out of education for non-health related issues, and seven students were excluded because they were injured at baseline. Baseline characteristics of all included students are shown in Table 4.1. The response rate of the intake questionnaire was 78.6%. In total, 971 monthly questionnaires were sent to the students, and 822 were completed, resulting in a response rate of 84.7% for the monthly questionnaires.

Injuries and Risk Factors

A total of 80 students (80.8%) reported at least one injury during the academic year, while 48 students (48.5%) reported at least one substantial injury.

The univariate analyses showed no significant associations between the independent variables and substantial injuries during follow-up (see Table 4.2). However, a non-significant trend ($p = 0.059$) was visible for injury history (OR: 0.36; 95% CI: 0.12–1.04). Of all factors included, coping skills (OR: 0.91; 95% CI: 0.84–0.98), age (OR: 0.67; 95% CI: 0.46–0.98), and BMI (OR: 1.38; 95% CI: 1.05–1.80) were identified as significant risk factors in the multivariate analysis. The multivariate model resulted in a model with good fit to the data [$\chi 2(df = 9) = 20.02$, $p < 0.05$], indicating a good match between the specified model and the empirical data. In total, the model explained 24% of the variance in the substantial injury group.

Table 4.1. Baseline characteristics shown as mean (±SD) or number (percentage).

	Overall
N	99
Education programme (Bachelor dance)	55 (55.6%)
First year students	46 (46.5%)
Second year students	34 (34.3%)
Third year students	19 (19.2%)
Sex (male)	28 (28.3%)
Age (years)	19.2 ± 1.5
BMI (kg/m²)	20.9 ± 1.9
Dance exposure (total hours academic year 2016/2017 per student)	1,046.5

Table 4.2. Univariate and multivariate models of potential risk factors for substantial injuries

	Non-injured (N = 51)[a]	Injured (N = 48)[a]	Univariate Analyses		Multivariate Analyses	
			OR (95% CI)	*p*	OR (95% CI)	*p*
Participant Characteristics						
Age (years)	19.45 (1.78)	18.94 (1.14)	0.79 (0.60-1.05)	0.10	**0.67 (0.46-0.98)**	**0.04***
Sex (male)	17 (33.3%)	11 (22.9%)	1.68 (0.69-4.10)	0.25	2.23 (0.73-6.81)	0.16
Educational programme (Bachelor dance)	28 (54.9%)	27 (56.3%)	0.95 (0.43-2.09)	0.89	0.80 (0.28-2.29)	0.67
BMI (kg/m²)	20.62 (1.77)	21.12 (2.03)	1.15 (0.93-1.43)	0.20	**1.38 (1.05-1.80)**	**0.02***
Injury history (yes/no)	6 (11.8%)	13 (27.1%)	0.36 (0.12-1.04)	0.06	0.36 (0.11-1.24)	0.11
Mental factors						
Total coping score	52.78 (11.35)	49.14 (9.00)	0.97 (0.93-1.01)	0.08	**0.91 (0.84-0.98)**	**0.01***
Mean score self-evaluative perfectionism	3.06 (0.44)	3.03 (0.33)	0.84 (0.31-2.34)	0.75	1.80 (0.42-7.72)	0.43
Mean score conscientious perfectionism	2.62 (0.48)	2.63 (0.41)	1.07 (0.44-2.59)	0.89	0.31 (0.07-1.30)	0.11
Total self-regulation score	114.18 (11.67)	111.1 (12.54)	0.98 (0.95-1.01)	0.21	1.01 (0.96-1.07)	0.66

OR, odds ratio; CI, confidence interval. a Data are presented as mean (±SD) or number (%). *Significant at $p < 0.05$.

Discussion

This is the first prospective cohort study investigating mental risk factors for substantial injuries among contemporary dance students. A 1-year substantial injury prevalence of 48.5% was found, meaning that "the students were not able to participate at all or had a moderate/severe reduction in training volume or performance because of an injury" according to Clarsen et al. (2014). Limited coping skills, lower age, and higher BMI were found to be associated with an increased injury risk. More specifically, per point higher on total coping score (range 0 – 84) students are 0.09 times (9%) less likely to sustain an injury, per year older students are 0.33 times (33%) less likely to sustain an injury, and per point higher on BMI students are 0.38 times (38%) more likely to sustain an injury. Furthermore, a non-significant trend was shown within the univariate analyses, suggesting students without an injury history are less likely to sustain an injury, which is in agreement with other studies in dance (Kenny et al., 2016) and in sports (Alahmad et al., 2020; B. Green et al., 2020; Saragiotto et al., 2014).

In total, the multivariate model explained 24% of the variance in the substantial injury group. However, the vast majority of sustained substantial injuries in this contemporary dance population was not explained by the factors included in this model.

Therefore, future research within dance should investigate other risk factors as well. For instance, several studies have shown that joint range of motion (i.e., lower extremity), dance exposure (i.e., years of training, exposure hours), poor aerobic capacity (Kenny et al., 2016), and stress (Mainwaring & Finney, 2017) are associated with injury risk. These factors might illuminate part of the unexplained variance in the current multivariate regression model and should, therefore, be included in future studies.

BMI

A recent systematic review within pre-professional ballet and modern dancers indicated that low BMI was significantly associated with an increased risk of injury (Kenny et al., 2016). However, this risk factor was based on only one, dated study (Benson et al., 1989), warranting further investigation. The present study showed that higher BMI (mean 20.9 ± 1.9) was associated with injury risk. Likewise, within sports, it has been shown that high BMI increases the risk for all sport injuries in adolescents (Richmond et al., 2013). They indicated an increased injury risk in obese adolescents compared to healthy adolescents of 34%, possibly due to "greater forces being absorbed through soft tissue and joints." Within the current study, four students scored above the norm of healthy BMI (>25, according to the World Health Organization, 2019), and these students were all substantially injured during the academic year. Therefore, results from the current study suggest that BMI could be monitored in student populations in relation to injury risk, and perhaps, specific attention might be desirable for students with a higher BMI. However, the variability of BMI between injured and non-injured students in the specific target sample is small. Therefore, the results should be interpreted with caution, and more research on specific BMI cut-off points within a dance population is needed to determine which students have an increased injury risk.

Age

Previous literature has shown conflicting results regarding age as a risk factor. Two studies indicated that higher age was associated with the incidence of contemporary dance injuries (mean age non-injured: 16.4 ± 3.8 years vs. mean age injured: 18.9 ± 4.8 years) (Campoy et al., 2011) and ballet/modern dance injuries (mean age: 15.8 ± 1.0 years) (Luke et al., 2002). However, Askling et al. (2002) found no association between age (mean age: 21 years, range 17–25) and the occurrence of hamstring injuries among ballet and modern dance students, whereas Bronner et al. (2003) found, in line with the results of the current study (mean age: 19.2 ± 1.5 years), that younger professional modern dancers (mean age: 22 ± 4.4 years vs. 27 ± 1.7 years) experienced a greater number of injuries. They suggest that "young dancers may require a transitional programme to assist them in managing the new stresses of professional dance," i.e., stress they experience

throughout their (academic) career (Bronner et al., 2003), which can also be helpful for the younger students in the studied population. Furthermore, within the sports injury literature, the adolescent growth spurt is commonly related to increased injury risk due to increased muscle-tendon tightness and decreased physical strength (Caine et al., 2008). For instance, the rate of growth in elite adolescent ballet dancers (mean age: 16 ± 1.6 years) is associated with an increased risk of lower extremity overuse injuries (Bowerman et al., 2014). This might also apply to the youngest students in the present study, since the studied population ranged from 16 to 25 years. Therefore, these students might be at a greater risk of sustaining an injury due to the adolescent growth spurt compared to the older, more mature, students. Another possible explanation is a bias due to left truncation, which is a common problem in cohort studies (Cain et al., 2011). Our sample consists of first, second, and third year students, whereby students in the second or third study year have higher values for age compared to the first year students. However, we can only include the students who survived so far. For example, students in the third year already survived the first and second year. Their classmates who dropped out in their first or second year were not included in our third year sample. However, personal communication with the dance departments revealed that only a small minority of the students drop out of the first or second year due to injuries (two students in 2016/2017). Therefore, we believe that the influence of left truncation on our results is rather small.

Coping

In line with the results of the present study, previous research within dance and sports has shown a relationship between coping and injury risk. A meta-analysis from different sport populations showed a weak relationship between coping skills and injury rates [r = −0.07, 80% CI (−0.10, −0.03)] (Ivarsson et al., 2017), while a systematic review of pre-professional ballet and modern dancers showed that insufficient coping skills (i.e., freedom from worry, confidence, and negative dance stress) are significantly associated with an increased injury risk (Kenny et al., 2016). The use of problem-focused coping strategies such as planning and problem solving may protect ballet and modern dancers from sustaining injuries by buffering the effects of stress (Barrell & Terry, 2003). These skills can probably help in perceiving fewer situations as stressful/problematic, as a stressful situation can cause greater injury risk due to muscle tension and lack of focus or attention (Williams & Andersen, 1998). However, due to small sample sizes in the current study, it was not possible to look into the different subscales/strategies of coping. Future research should, therefore, take different coping strategies into account, as well as a possible moderating effect via stress on injury vulnerability.

Perfectionism

Perfectionism is often mentioned as a personality trait of ballet and contemporary dancers, and associated with maladaptive characteristics (Nordin-Bates et al., 2011). However, in the current study, no significant association was found between perfectionism and the occurrence of injuries. In contrast, Krasnow et al. (1999) and Liederbach and Compagno (2001) showed associations between perfectionism and injury occurrence among modern and ballet dancers. However, different measurement methods and questionnaires were used in both studies compared to the present study. Furthermore, causality was not shown in both studies due to methodological limitations. Finally, the studied population of Krasnow et al. (1999) had a lower mean age compared to the studied population (15.5 ± 0.5 years vs. 19.2 ± 1.5 years), whereas adolescence is marked as a key period for the development of individual differences in perfectionism (Damian et al., 2013), making it difficult to compare these results. It is possible that the direct link between perfectionism and injury is not visible due to an indirect effect of perfectionism on the relationship between stress and injury. Ballet and contemporary dancers with perfectionistic tendencies show greater anxiety and lower self-confidence than other dancers (Nordin-Bates et al., 2011), which can influence the stress response and, as a result, the probability of injury occurrence (Williams & Andersen, 1998).

Self-Regulation

Self-regulation has been linked to various well-being outcomes (Sanders & Mazzucchelli, 2013). However, within the present study, no relationship between self-regulation and injury occurrence has been found. To our knowledge, no study has investigated the relationship between self-regulation and injuries within a dance population. A recent study within sports, among young female tennis players, did show that self-regulatory skills can predict injuries (van der Sluis et al., 2019). The difference could be explained by the large difference in mean age of the studied population (12.4 ± 1.1 years vs. 19.2 ± 1.5 years) and by the use of different self-regulation questionnaires, making it difficult to compare these results.

Moreover, it is known that athletes are often conflicted between protecting their health and expanding the boundaries of their bodies' capacities in order to achieve peak performance, especially in adolescence (van der Sluis et al., 2019). During adolescence, an increased predisposition is present toward short-term success despite possible long-term consequences, due to developmental cognitive processes, which, in turn, seems to be related to injuries (van der Sluis et al., 2017). Within ballet, contemporary, and modern dance, a culture of dancing through pain and injuries is well known (Cahalan et al., 2019; Gamboa et al., 2008; Luke et al., 2002), making it even more difficult to make the right decisions regarding your health.

For instance, as stated by Rivera et al. (2012), "perceptions about how dancers are expected to work through pain play a significant role in whether they will choose to rehabilitate." Yet, it is also acknowledged that athletes, such as elite runners, use self-regulation to keep track of their bodies, by monitoring their feelings and pain in order to achieve long-term goals (Brick et al., 2015). Furthermore, Clark and Zimmerman (2014) indicate how people use self-regulatory skills to manage health and to prevent or control diseases. This apparent contradiction between protecting your health and pushing limits in order to reach peak performance could possibly explain why the results in the present study did not lead to a significant association between self-regulation and sustaining an injury.

Furthermore, self-regulation could possibly have a modifying effect on stress and, therefore, on sustaining an injury, according to the stress-and-injury model (Williams & Andersen, 1998). For example, studies among students have shown that self-regulation capacity can predict levels of well-being, mental health functioning, and stress and, thus, the likelihood of injury occurrence (Gagnon et al., 2016; Park et al., 2012). Moreover, Baumann et al. (2007) showed that negative effects (e.g., reduced emotional well-being and more psychosomatic symptoms) of a stressful situation were only visible when individuals had low (affect) self-regulatory abilities (e.g., impaired ability to self-generate positive affect or reduce negative affect). More research into the relationship between self-regulation, stress, and injury within dance is necessary.

Strengths, Limitations, and Recommendations

The major strength of the current study is the prospective cohort design of risk-factor analyses with monthly follow-up, resulting in a low recall bias and a greater understanding of injury causality. In addition, the response rate to the monthly questionnaire was high (85%), possibly due to the use of an online feedback system (van Winden et al., 2019). Moreover, to our knowledge, this is the first study to gain insight into mental risk factors for substantial injuries within contemporary dance students on a longitudinal basis.

However, there are some limitations to this study. First, the power of the analyses are rather small due to a limited sample size (N = 99), since only a limited cohort was available for longitudinal research. Therefore, the commonly used "rule of 10" could not be applied (9 potential predictors, 48 events), resulting in overfitting of the final model. This can bias regression coefficients in both positive and negative directions (Peduzzi et al., 1996), since low power increases the likelihood of producing a miss (Type 2 error) or false-positive (Type 1 error) (Schweizer & Furley, 2016). This urges us to be careful in drawing (firm) conclusions.

Second, we conducted logistic regression analyses, and one of the restrictions of these models is that the exposure (in our case, the number of hours each dance student participated in dance activities) must be about equal for every participant (Bahr & Holme, 2003). In sports, playing time can vary greatly between players in the same team. For example, match exposure is significantly higher in the best players of the team compared to the substitutes. In our sample, this is not the case because all students were enrolled in either the Bachelor dance or Bachelor dance teacher education programme, and therefore, there were no major interpersonal differences in the scheduling of classes, rehearsals, or performances (van Winden et al., 2020a). Furthermore, drop-out may lead to large variations in exposure time. However, in our study, only one student dropped out, and this student was excluded from the analyses. Finally, injuries may affect the exposure time. For example, in Dutch male soccer players, match incidence was 32.8 per 1,000 player-hours, and the median injury time loss was 8 days (Stubbe et al., 2015). Therefore, injuries may significantly reduce exposure time. However, in dance students, injury incidence and time loss is much lower, 1.9 injuries per 1,000 h of dance activity and 5.7 days, respectively (van Winden et al., 2019). Therefore, reduction of exposure due to injuries is less of a problem in dance studies, compared to studies including athletes. Third, this study used self-reported outcomes for injury severity and psychological constructs, which produced subjective data and a lack of detailed diagnostic information. To gain more insight into possible differences in mental risk factors between injury types, the inclusion of a follow-up by medical health professionals during the data collection period is recommended in future studies, indicating detailed diagnostic information per injury. For instance, the difference between "acute" vs. "overuse" injuries is relevant, since there might be different mental risk factors for acute vs. overuse injuries (Pensgaard et al., 2018). Furthermore, not all used questionnaires are dance specific. The coping questionnaire is sport specific and has been made dance specific for this study; however, psychometric properties were not re-evaluated. Furthermore, self-regulation has been seen as a domain general concept (van der Sluis et al., 2019). Finally, when using questionnaires on psychological constructs, it is important to be aware of the possibility of a social desirability bias (Neal & Carey, 2005). In order to reduce the potential of social desirability, results from the questionnaires were not shared on an individual level with the students' teachers in this study, since dancers might worry that their results will impact their participation in classes or performances, which has been mentioned before in regard to physical health in dance (Kenny et al., 2018) and mental health in sports (Bauman, 2016).

Conclusion

This study aimed to identify psychological constructs as risk factors for substantial injuries in contemporary dance students according to the stress-and-injury model of Williams and Andersen (1998), specifically coping and personality traits (perfectionism and self-regulation). The results partly confirm our hypothesis, since students with limited coping skills as well as younger students and students with a higher BMI are at higher risk for substantial injuries, while no significant results were found for perfectionism and self-regulation. These results are based on a relatively small population; therefore, the results should be interpreted with some caution. More prospective research into mental risk factors for dance injuries, among this high-risk population, with larger sample sizes is needed to develop preventive strategies. Besides, it is important to include stress (as a potential mediator) in further research, since there are different indications that, for instance, the influence of coping and perfectionism on injuries could (partly) run through effects of stress on sustaining an injury. Furthermore, exposure to risk factors for (dance) injuries can be frequent and variable throughout dance participation (Meeuwisse et al., 2007). As such, potential risk factors, such as stress or coping, should be collected at regular intervals, just as the outcome data.

Still, for now, the current findings provide us with new information on the relevance of coping, age, and BMI in sustaining a dance injury, which might be used to enhance the prevention of injuries within contemporary dance students. For instance, as stated by Ivarsson et al. (2017) "including psychological-based training programmes into other types of injury prevention programmes (e.g., biomechanical, strength training) has the potential to reduce the risk of injuries." More specifically, dance schools could consider including coping skills training as part of injury prevention programmes in their curriculum and, perhaps, providing special attention to younger dancers and those with a higher BMI through transitional programmes to assist them in managing the stress they experience throughout their (academic) career.

Chapter 5.

The association between stress and injury: a prospective cohort study among 186 first-year contemporary dance students

van Winden, D., van Rijn, R. M., Savelsbergh, G. J. P., Oudejans, R. R. D., & Stubbe, J. H. (2021). Frontiers in Psychology, 12, 770494.

Abstract

The demanding environment that contemporary dance students are exposed to could result in high stress levels, which can influence injury susceptibility. Therefore, this study aims to investigate the association between stress and injuries. In the period between September 2016 and March 2020, four cohorts of first-year dance students (N = 186; mean age 19.21 ± 1.35 years) were followed for one academic year. Each month, general stress was assessed on a 0-100 visual analogous scale. The Oslo Sports Trauma Research Center Questionnaire on Health Problems was used on a monthly basis to monitor injuries. Injuries were defined as 'all injuries' (i.e., any physical complaint irrespective of the need for medical attention or time-loss from dance) and 'substantial injuries' (i.e., leading to moderate/severe/complete reductions in training volume or performance). Mann-Whitney tests were performed to measure differences in general stress levels between injured and injury-free students, while repeated-measures ANOVA were performed to investigate whether general stress scores increased before and during injury occurrence. The overall average monthly general stress score over all cohorts for all students was 39.81. The monthly general stress scores ranged from 31.75 to 49.16. Overall, injured and substantially injured students reported higher stress scores than injury-free students, with significant differences in three out of the nine months for all injuries (September, October, March, $p < 0.05$), and in five months for substantial injuries (September, October, November, December, April, $p < 0.05$). Within the three-month period before and during injury occurrence, a (marginally) significant linear effect of general stress across the time periods was found for all injuries ($F(1.87, 216.49) = 3.10$, $p = 0.051$) and substantial injuries ($F(2, 138) = 4.16$, $p = 0.018$). The results indicate an association between general stress and injuries. Future research should focus on effects of varying stress levels on injury risk using higher sampling frequency, for instance by measuring weekly since stress levels are likely to fluctuate daily. Practically, strategies aiming at stress reduction might have the potential to reduce the burden of dance injuries and may have positive outcomes for dancers, teachers, schools and companies.

Introduction

Contemporary dance includes a variety of styles and genres of dance and continues to grow in popularity (R. Martin, 2013). It mainly represents a fusion of styles and has specific aesthetic values; choreographers classify common traits such as experimental elements, a conceptual framework, or the inclusion of improvisation, text, or multimedia elements (Giguere, 2018). Contemporary dance training requires advanced physical and artistic skills and may consequently increase dancers' susceptibility to injury (Kenny et al., 2016). Reported injury incidence rates among pre-professional dancers, ranging from 0.77 to 4.71 injuries per 1,000 hours of dance, have indicated that dance is a high-risk activity (Kenny et al., 2016; van Winden et al., 2019).

Physiological and biomechanical risk factors for injuries have traditionally been dominant within the history of dance research (Mainwaring & Finney, 2017). Only a few studies have focused on the mental risk factors of injuries in dance students, although psychological skills can be considered modifiable (Kenny et al., 2016) and might affect the occurrence of dance injuries (Mainwaring & Finney, 2017). For instance, studies including pre-professional dance students demonstrated associations between injuries and psychological coping skills (Noh et al., 2005, 2007) and perceptions of fatigue (Liederbach & Compagno, 2001).

In order to provide a theoretical framework to clarify the relationship between mental aspects and (sports) injury occurrence, Williams and Andersen (1998) proposed the stress-and-injury model, which is supported by a more recent meta-analysis (Ivarsson et al., 2017). The meta-analysis showed that a strong stress responsivity has the strongest association with injury risk in sports compared to the other variables that are connected to injury risk according to the model (e.g., personality, history of stressors, coping). The model suggests that the stress response in a potentially stressful situation can influence injury risk due to increased muscle tension and decreased coordination, a lack of focus and increased self-consciousness (Ivarsson et al., 2017; Staufenbiel et al., 2013; Williams & Andersen, 1998). Moreover, prolonged stress can cause changes in brain functions that increase the risk of poor decision-making (Ivarsson et al., 2017), which has also been related to increased injury risk (Gabbett et al., 2012). The model can be applied to dance-specific examples according to a literature review of Pollitt and Hutt (2021), as for instance done by van Winden and colleagues (2020b). In line with the stress-and-injury model, the results of the systematic review of Mainwaring and Finney (2017) also showed that stress, psychological distress, coping and personality were associated with risk of dance injury.

Stress occurs when the environmental demands exceed the abilities of an individual to cope with the demands of specific events or experiences (e.g., stressors) (Lazarus & Folkman, 1984). These stressors can arise from both the dancer themselves and the dance environment, such as: high expectations from others, competitive auditions and a demanding training schedule (Adam et al., 2004; Krasnow et al., 1999). In line with these perceived stressors, the most reported types of mental health issues among contemporary dance students were general anxiety, stress due to external factors and constant tiredness (van Winden et al., 2020a).

Studies including pre-professional ballet dancers have indicated associations between injuries and general negative stress (Mainwaring et al., 1993), as well as dance-specific negative stress (Krasnow et al., 1999; Mainwaring et al., 1993). Furthermore, stress has been associated with injury-caused absence from dance activities and prolonged injury duration in (pre-)professional ballet dancers (Adam et al., 2004; Noh et al., 2005). However, the current body of research focusing on stress and dance injuries is insufficient to draw decisive conclusions (Kenny et al., 2016; Mainwaring & Finney, 2017). Prospective cohort studies are needed (Kenny et al., 2016), as longitudinal and frequent monitoring of perceived stress may provide further insight into the changes in stress levels in relation to the dynamic nature of injury occurrence (van der Does et al., 2017).

In addition, most of the previously mentioned studies did not include (contemporary) dance students. Especially within the academic setting, injuries can have a tremendous effect leading to hindered artistic development due to absences from dance activities (Kenny et al., 2016), and even study delay or early drop-out of university. Furthermore it is possible that the specific academic environment could result in even higher stress levels compared to the general dance setting, due to, for example, the limited timeframe for achieving artistic and academic goals (Weigert, 2005). Besides, it is possible that all new (i.e., first-year) dance students are at an elevated level of injury risk, due to stressors such as moving, managing finances, and homesickness (Pollitt & Hutt, 2021). Therefore, a prospective cohort study with four cohorts of first-year contemporary dance students over the course of a full academic year was performed to gain more insight into the association between general stress levels and injuries (i.e., physical complaints irrespective of the need for medical attention or time-loss from dance). We hypothesize that students perceive more stress when injured.

Materials and Methods

Participants

Four cohorts of first-year contemporary dance students of Codarts Rotterdam, University of the Arts, the Netherlands (N = 186), were prospectively followed during one academic year (September to June) from the study year 2016/2017 until 2019/2020. Due to the COVID-19 lockdown, results from March 2020 until June 2020 were excluded from the analysis, as students were not able to follow regular classes during that period. Students were enrolled in a four-year educational programme of either a Bachelor Dance or Bachelor Dance Teacher. Both Bachelor programmes focus on acquiring the required technical dance competencies with classes containing a wide range of modern techniques (e.g., Cunningham, Graham, Laban, Limon), (modern) jazz, ballet, and 'floorwork'. In addition, a large number of guest teachers contribute their personal styles, often inspired by their own development and research. Furthermore, performance creative skills (i.e., improvisation, composition and drama) are important. Besides, health classes including basic knowledge of nutrition, anatomy and (sport) psychology are being offered within the first-year of the Bachelor Dance's curriculum. Within the first-year of the Bachelor Dance Teacher, students have classes on reflection, communication and dealing with feedback.

Procedures

Data was collected at regular intervals for management and educational purposes and data collection was embedded in the curriculum. All students were informed about the procedure and provided written consent in accordance with the Declaration of Helsinki. Ethical approval for the study was provided by the Medical Ethics Committee Erasmus MC of Rotterdam, the Netherlands (MEC-2019-0163).

During the first month of each academic year, baseline characteristics were recorded including age (years), sex (male/female), BMI (kg/m2), educational programme (Bachelor Dance or Dance Teacher), and one-year history of injury (yes/no). One-year injury history was defined as "any physical complaint resulting in a fulltime loss of dance activities (e.g., participation in class, rehearsal, performance) for at least one week beyond the day of onset in the past year" (van Seters et al., 2020, p. 2). During the academic year, all students were asked to complete monthly questionnaires on their physical and mental health through the Performing artist and Athlete Health Monitor (PAHM). PAHM was developed by Codarts Rotterdam and is used to monitor physical and mental health in pre-professional and professional performing artists and athletes (Karreman et al., 2019; Stubbe et al., 2018; van Winden et al., 2019). This system consists of several questionnaires and items (e.g., visual analogue scale (VAS) on pain; VAS

stress; Oslo Sport Trauma Research Center Questionnaire on Health Problems; injury characteristics; items on sleep quality, feelings and emotions, satisfaction with rehearsals and performances).

Stress registration

A visual analogue scale (VAS) was used to measure perceived general stress scores on a monthly basis. Students indicated their general stress scores on a scale ranging from 0 (no stress) to 100 (extreme amount of stress). The VAS is frequently used in stress assessment and several validity studies have highlighted its psychometric properties. The VAS is at least as sensitive as other stress scales (i.e., 14-items Perceived Stress Scale) (Lesage et al., 2012), is significantly correlated with objective stress measurements such as cardiovascular parameters (e.g., heart rate, blood pressure) (Hulsman et al., 2010), shows satisfactory reliability (Lesage et al., 2009) and inter-judge reliability (Lesage et al., 2011). No minimal clinically important difference has been determined (Rotter et al., 2020).

Injury registration

The Oslo Sport Trauma Research Center (OSTRC) Questionnaire on Health Problems is one component of the monthly questionnaire and consists of four key questions on the consequences of health problems on dance participation, training volume, performance and the degree to which students perceive any symptoms (Clarsen et al., 2014). Possible answers ranged from 0 (no problem, no reduction, no effect, or no symptoms) to 25 (cannot participate at all or severe symptoms) (Clarsen et al., 2013). Questions 1 and 4 were scored on a four-point scale (0, 8, 17, and 25), while questions 2 and 3 were scored on a five-point scale (0, 6, 13, 19, and 25). The OSTRC Questionnaire has a high internal consistency, with a Cronbach's alpha of 0.96, good face validity (Clarsen et al., 2013, 2014), and has previously been used within the performing arts (Kenny et al., 2018; Stubbe et al., 2018, 2021; van Seters et al., 2020; van Winden et al., 2019, 2020b, 2020a).

The severity of a health problem was calculated by the sum score of the four questions (scale 0-100) according to the method proposed by Clarsen et al. (2013). If the severity score was higher than zero, a health problem was registered and the student was asked whether the health problem was an injury, mental complaint, or other problem. An injury was defined as "any physical complaint sustained by a dancer resulting in a severity score higher than zero (i.e., leading to consequences on participation, training volume, and/or performance), irrespective of the need for medical attention or time-loss from dance activities" (van Winden et al., 2019, p. 2). Students were categorized as having a substantial injury if they reported problems leading to moderate or severe reductions in training volume

(value ≥13 on question 2 of the OSTRC Questionnaire) or moderate, severe, or complete reductions in performance (value ≥13 on question 3 of the OSTRC Questionnaire) (Clarsen et al., 2014).

Statistical analyses

Statistical analyses were performed using SPSS V.26 (IBM, Armonk, USA) and statistical significance level was set at an alpha level > 0.05. Missing data were excluded pairwise. Descriptive statistics were used to describe baseline characteristics and general stress scores using medians and ranges or frequency and proportions (%). Body mass index was calculated from dancers' baseline height and weight. Non-parametric tests were used as not all of the data had a normal distribution as indicated by the Shapiro-Wilk tests of Normality. Mann-Whitney tests for each month were used to compare general stress scores between injured and injury-free students, and between substantially injured and non-substantially injured students. Effect sizes (r) were measured by dividing the z-score with the square root of N (size of the study sample) (Field, 2009).

According to the injury registration, specific 'time periods' were marked as 'injury-free period', 'pre-injury period' or 'injury period' (Figure 5.1), which is adjusted from the method previously used by van der Does and colleagues (2017). For example, if a student reported a substantial injury in March, January was marked as an injury-free period, February was classed as the pre-injury period, with March being the injury period. Repeated-measures ANOVA with follow-up polynomial contrasts and pairwise comparisons were performed to investigate whether general stress scores increased within this three-month period. Only injured students were included in these analyses. For each injured student, only the first 'complete set' of scores was used. Therefore, the months after the injury period were not taken into account.

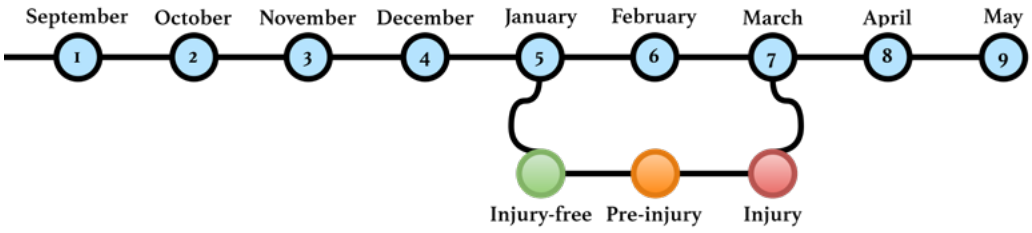


Figure 5.1. Timeline example with specific time periods marked as 'injury-free period', 'pre-injury period' or 'injury period'.

Results

Participants

A total of 193 students from the Bachelor Dance and Bachelor Dance Teacher were prospectively followed during their first academic year. A total of 186 students (68.3% females) agreed to participate and were all included in the present study, with a median age of 18.94 (range 17.00 – 28.60) (Table 5.1). Within the study years 2016/2017, 2017/2018 and 2018/2019 there were 46 participants, whereas study year 2019/2020 included 48 participants. In total, 1,530 monthly questionnaires were sent to these students (maximum of nine per student) and 1,391 were completed, resulting in a response rate of 90.9%.

Overall general stress scores

The overall average monthly general stress score was 39.81 (SD = 23.24) over all included cohorts and for all first-year students. Figure 5.2 demonstrates that the monthly stress scores ranged from 31.75 to 49.16.

Table 5.1. Baseline characteristics shown as median (range) or number (percentage).

	Overall
N	186
Education programme (Bachelor Dance)	121 (65.1%)
Sex (female)	127 (68.3%)
Age (years)	18.94 (17.00 – 28.60)
BMI (kg/m²)#	20.81 (17.73 – 29.13)
One-year history of injury (yes)*	60 (32.3%)

missing data of N = 1. * missing data of N = 3.

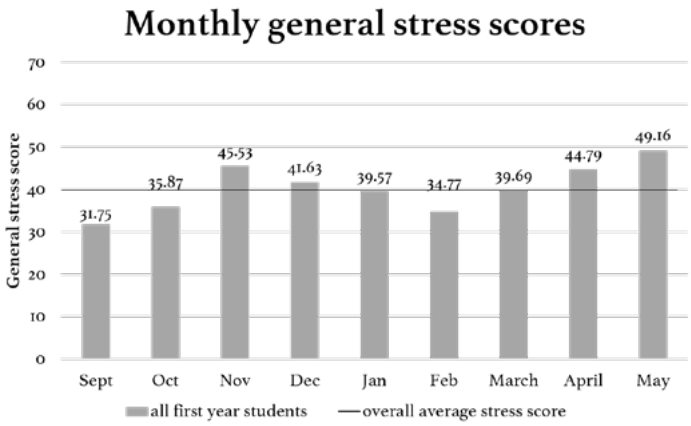


Figure 5.2. Stress scores throughout the academic year for all first-year students, including the overall average monthly general stress score.

Difference in general stress scores for injured and injury-free students

Differences in general stress scores for either injured (i.e., 'all injuries': students who indicated at least one physical complaint irrespective of the need for medical attention or time-loss from dance during the previous month) and injury-free students (i.e., students who did not indicated any physical complaints), or substantially injured (i.e., students who indicated at least one physical complaint leading to moderate/severe/complete reductions in training volume or performance) and non-substantially injured students (i.e., injury-free and non-substantially injured students) are shown in Table 5.2. During three out of the nine months (i.e., September, October and March), injured students reported significantly higher general stress scores than their injury-free peers, with small effect sizes. For the remaining six months, stress scores of injured students compared to injury-free students were higher across five of the six months, although not significantly. Furthermore, general stress scores were significantly higher in substantially injured students compared to non-substantially injured students for five out of the nine months (i.e., September, October, November, December and April), with small to medium effect sizes. For the remaining four months, stress scores of substantially injured students compared to non-substantially injured students were higher, although not significantly.

Table 5.2. Stress scores for injured and injury-free students, and substantially and non-substantially injured students.

	September	October	November	December	January	February	March	April	May
Mean injury-free	28.9	32.39	44.32	41.38	40.91	34.73	36.33	43.21	48.42
Mean injured	36.84	42.96	48.19	42.28	37.51	34.82	43.76	47.24	50.48
Significance level (*p*)	0.04*	0.002**	0.355	0.689	0.405	0.861	0.047*	0.259	0.70
Effect sizes (*r*) #	-0.16	-0.23	-0.07	-0.03	-0.06	-0.01	-0.18	-0.10	-0.04
Mean non-substantially injured	30.3	33.68	42.49	40.09	38.76	33.97	38.58	42.85	48.1
Mean substantial injured	44.17	54.72	63.92	53.42	43.89	39.78	45.83	56.33	54.58
Significance level (*p*)	0.038*	0.00**	0.00**	0.021*	0.273	0.273	0.217	0.017*	0.238
Effect sizes (*r*) #	-0.16	-0.30	-0.32	-0.18	-0.08	-0.08	-0.11	-0.21	-0.11

* significance at $p < 0.05$ ** significance at $p < 0.001$
# small effect size: r = 0.1 – 0.3; medium effect size: r = 0.3 – 0.5; large effect size: r => 0.5 (Field, 2009).

General stress scores before and during the occurrence of an injury

For both outcome measures, all injuries (N = 117) and all substantial injuries (N = 70), general stress scores increased from the injury-free period to the injury period (Figure 5.3).

With regards to all injuries, the assumption of sphericity was violated by Mauchly's Test of Sphericity [$\chi 2(2) = 8.55$, $p < 0.05$]. As a result, the Greenhouse-Geisser correction was used. There was a marginally significant effect of 'time period' on general stress scores: $F(1.87, 216.49) = 3.10$, $p = 0.051$. Follow-up polynomial contrasts indicated a significant linear effect of stress scores increasing across the time periods (i.e., injury-free, pre-injury and injury period), $F(1, 116) = 4.95$, $p = 0.028$. Pairwise comparisons indicated that stress scores were significantly higher during the injury period ($M = 43.89$, $SD = 22.80$) compared to the injury-free period ($M = 38.78$, $SD = 21.76$, $p = 0.028$), but not compared to the pre-injury period ($M = 40.36$, $SD = 22.47$, $p = 0.106$). Further, stress scores in the pre-injury period were not significantly higher compared to the injury-free period ($p = 0.385$).

With regards to substantial injuries, there was a significant effect of 'time period' on general stress scores: $F(2, 138) = 4.16$, $p = 0.018$. Follow-up polynomial contrasts indicated a significant linear effect of stress scores increasing across the time periods, $F(1, 69) = 6.89$, $p = 0.011$. Pairwise comparisons indicated that stress scores were significantly higher for the substantial injury period ($M = 50.23$, $SD = 23.01$) compared to the injury-free period ($M = 42.57$, $SD = 22.35$, $p = 0.011$), but not compared to the pre-injury period ($M = 47.30$, $SD = 21.98$, $p = 0.293$). Although, stress scores in the pre-injury period were significantly higher compared to the injury-free period ($p = 0.045$).

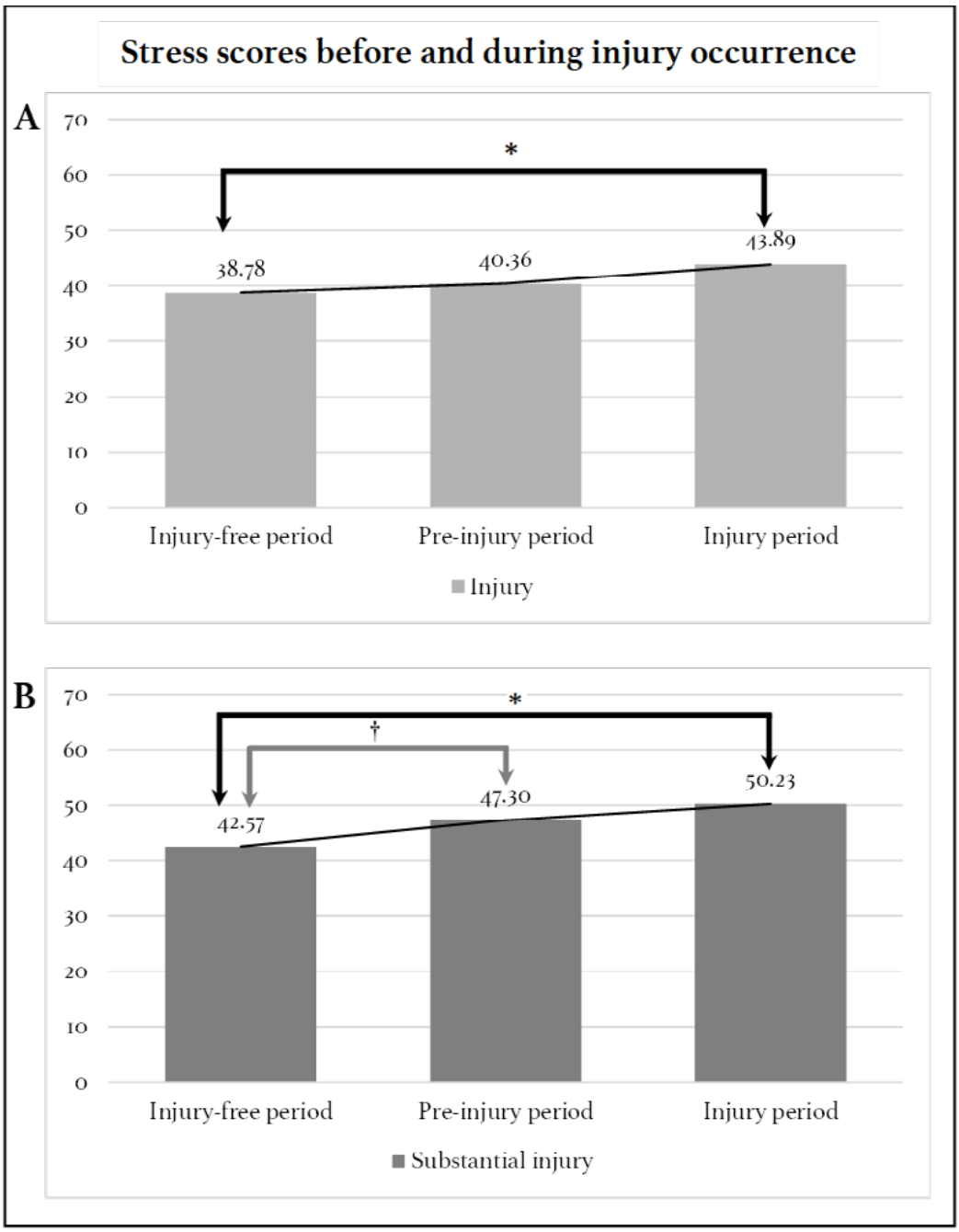


Figure 5.3 (A,B). Stress scores in the injury-free, pre-injury and injury periods for all injuries (A) and substantial injuries (B), with significant differences between the injury-free and injury periods for both injury definitions (*), as well as between the injury-free and pre-injury period for substantial injuries (†), $p < 0.05$.

Discussion

This study investigated the association between general stress levels and injuries among first-year contemporary dance students. It was hypothesized that students perceive more stress when injured. Our results confirmed these hypotheses, indicating an association between stress levels and injuries, especially substantial injuries.

With regards to substantial injuries, there was a significant effect of 'time period' on general stress scores: $F(2, 138) = 4.16$, $p = 0.018$. Follow-up polynomial contrasts indicated a significant linear effect of stress scores increasing across the time periods, $F(1, 69) = 6.89$, $p = 0.011$. Pairwise comparisons indicated that stress scores were significantly higher for the substantial injury period ($M = 50.23$, $SD = 23.01$) compared to the injury-free period ($M = 42.57$, $SD = 22.35$, $p = 0.011$), but not compared to the pre-injury period ($M = 47.30$, $SD = 21.98$, $p = 0.293$). Although, stress scores in the pre-injury period were significantly higher compared to the injury-free period ($p = 0.045$).

A one-year injury incidence proportion of 67.6% (N = 125) for all injuries (i.e., any physical complaint leading to consequences on participation, training volume, and/or performance, irrespective of the need for medical attention or time-loss from dance activities) and 43.2% (N = 80) for substantial injuries (i.e., leading to moderate or severe reductions in training volume or moderate, severe, or complete reductions in performance) was recently indicated by van Rijn and Stubbe (2021) within the same sample of first-year contemporary dance students. In general, our between-subject analyses showed that injured students and substantially injured students reported higher general stress scores than their injury-free or non-substantially injured peers across all months, except for January, in which injury-free students scored higher than injured students. These results were significant for all injuries during three out of the nine months, and for substantial injuries during five out of the nine months. The results for January might differ due to the fact that January is a relatively 'easy' month within the academic calendar and was preceded by a holiday break. Furthermore, significantly higher stress scores were found in the months September and October for (substantially) injured students, consistent with the start of the first semester. Sustaining an injury in the beginning of their academic career could result in higher stress, since students are still adjusting to their new environment (e.g., the intensity of classes, social aspects, teachers' reactions towards injuries et cetera). These stressors arise on top of the stressors all new (i.e., first-year) dance students experience (e.g., moving, managing finances, and homesickness) (Pollitt & Hutt, 2021). In addition, within-subject analyses showed that general stress scores significantly differed between the injury-free period and the injury period for injured students and substantially injured students.

The indicated association between stress levels and injuries is in agreement with previous research. Studies including pre-professional ballet dancers found associations between injuries and negative (general and/or dance-specific) stress (Adam et al., 2004; Krasnow et al., 1999; Noh et al., 2005). In the sports literature, the stress-and-injury model of Williams and Andersen (1998) highlights the association between stress and injuries. Major psychosocial stressors (i.e., events resulting in major changes in the life of those affected) (Junge, 2000) and minor or everyday events (e.g., health, workload, or social issues) (Lazarus & Folkman, 1984) can have an effect on stress and thereby increase injury risk. Contemporary dance students are, for instance, exposed to life events, such as managing finances, homesickness, competitive auditions, approaching exams and performances and high expectations from others which can lead to great amounts of stress (Adam et al., 2004; Mainwaring et al., 1993; Pollitt & Hutt, 2021).

Furthermore, in-depth descriptive measures into the three-month period before and during the occurrence of either all injuries or substantial injuries showed a significant linear effect of general stress scores increasing across the time periods for all injuries and substantial injuries. For both outcome measures, the stress scores were significant higher during the injury period (i.e., the month of injury occurrence). Previous dance literature has shown conflicting results regarding stress levels before an injury occurs, with most studies reporting no association between work-related stress and injuries (Mainwaring & Finney, 2017). One exception, Patterson and colleagues (1998) indicated that negative life events, which resulted in elevated stress, were significant predictors of subsequent injuries within ballet dancers, especially when dancers experienced low social support. These outcomes showed parallels with our results.

Practical implications

Although the literature of dance medicine and science has traditionally focused on physical risk factors of injuries, our results indicate that psychological variables in general may be associated with the occurrence of dance injuries, in agreement with recent reviews within dance (Mainwaring & Finney, 2017; Pollitt & Hutt, 2021). Psychological training programmes aimed at reducing stress levels might have the potential to reduce the burden of dance injuries and may have positive outcomes for dancers and those in their environment (e.g., dance schools, teachers, directors and health professionals), as recommended by Ivarsson and colleagues (2017) in the context of sports. According to previous literature, a reduction in injury risk is likely when students are able to manage their stress levels better (Fawkner et al., 1999). For example, Noh and colleagues (2007) showed that within young ballet dancers, imagery,

self-talk and relaxation techniques enhanced psychological coping skills and reduced injury frequency and duration. Besides, mindfulness can be an effective instrument to achieve a relaxed state of body and mind (Arvinen-Barrow & Walker, 2013), and potentially reduce stress and the subsequent physiological (e.g., relaxation) and attentional (e.g., mindfulness) changes (Ivarsson et al., 2017). A recent study among university dance students indicated that improvements in mindfulness may help students with numerous general and dance-specific demands (Blevins et al., 2021).

Considering a different approach, the management of workload (i.e., the amount and intensity of dance classes, rehearsals and performances) and training environment (e.g., dance floors, mirror use, noise, amount of breaks) could also aid towards protecting dancers' physical and mental health (Grove et al., 2013; Rice et al., 2016), thus reducing stress levels. To illustrate, the monthly stress levels peaked in periods with exams and special project weeks. Moreover, dancers typically face an increase in demands prior to important performances, in contrast to sports where tapering periods are common before an important match (Balk et al., 2018). Lowering workload during stressful periods, as well as facilitating possibilities for dancers to leave their dance bubble (i.e., the social, professional and education environment that is connected to dance) for 'mental detachment' by, for instance, taking time off after stressful periods or organizing non-dance activities (Balk et al., 2018), might help balance stress levels throughout the year, and thereby influence the injury burden. However, future research should look more closely at changes in training load on individual level preceding the onset of injury (Drew, 2015; Lee et al., 2017), in order to gain more insight into the stress-workload relationship.

Strengths, limitations and recommendations

To our knowledge, this is the first study to gain insight into general stress levels over time and the association with injuries within first-year contemporary dance students. A major strength of the current study is the prospective design in which we used a monthly follow-up, resulting in low interference of recall bias for injuries. In addition, the response rate to the monthly questionnaire was very high (90.9%), as a result of integrating the online monitoring system and feedback tool with visual information about their personal data (i.e., PAHM) within the educational programme (Richardson et al., 2017; van Winden et al., 2019).

Yet, there are a number of limitations to the present study. First, the used self-reported outcomes for injuries and general stress scores resulted in subjective data and limited diagnostic information. Therefore, in future research, we recommend to measure objective stress levels to supplement the subjective data, using physical parameters such as cortisol or amylase (Takai et al., 2004).

Second, students indicated an overall monthly general stress score, since administering questionnaires on a monthly basis yields a more practical health monitoring tool with higher compliance compared to, for instance, weekly (Richardson et al., 2017) or daily monitoring. However, stress levels are likely to fluctuate on a day-to-day basis (von Rosen et al., 2017a), whereby sudden changes and short periods of high stress could potentially be overlooked when using a monthly measuring method (van der Does et al., 2017). Therefore, future research should consider including higher sampling frequencies, for instance on weekly basis. Moreover, in line with the dynamic nature of stress, future research should examine the effects of intra-individual varying stress levels on injury risk. However, higher sampling frequencies are needed to adequately perform these in-depth analyses. To illustrate, a study among athletes indicated a significant increase in stress scores in the week prior to injury (Fawkner et al., 1999), showing a much shorter time period between changes in stress levels and injury occurrence than measured in our study (week versus month). Gaining insight in these intra-individual varying stress levels can, for instance, be achieved by using more sophisticated statistical models, such as joint models, in which survival and longitudinal sub-models are linked and specific, individual predictions can be included (Long & Mills, 2018).

Besides, the current study focused on students' perceived general stress before or during the month of incurring an injury. Previous research has shown that perceived stress and recovery during the injury period differed between injured and healthy athletes; injured athletes perceive more stress and feel less recovery during the period that they were injured (Evans et al., 2012). Consequently, in order to inform return-to-dance interventions, it is essential to conduct further research into perceived stress and recovery levels during injury periods (van der Does et al., 2017). Furthermore, future research should include other mental and physical risk factors as well, especially due to the small to medium effect sizes found in this study. For instance, studies have shown that dance exposure (i.e., years of training, exposure hours) or poor aerobic capacity could be associated with injury risk (Kenny et al., 2016). In addition, studies on sports have indicated mental detachment (Balk et al., 2019), perceived recovery (van der Does et al., 2017), sleep volume (von Rosen et al., 2017b, 2017a) and self-esteem (von Rosen et al., 2017a) as potential injury risk factors.

Finally, the present study was conducted among a first-year contemporary dance student population. These results may help direct injury prevention in second-year students in light of the similarity across their curriculums. However, generalisability to third-year (and fourth-year) dance students is limited, as these curriculums differ to a larger extent. Besides, it is questionable if the results can be generalized to other populations such as pre-professional ballet dancers or professional dancers.

Future directions in dance research should focus on large prospective cohort studies. These studies will allow us to perform subgroup analyses based on different dance populations.

Conclusion

Overall, our results indicate an association between general stress levels and injuries in first-year contemporary dance students, in line with the stress-and-injury-model of Williams and Andersen (1998). Between-subject analysis indicated that injured and substantially injured students reported higher general stress scores than injury-free or non-substantially injured students, although not all monthly scores were significantly higher for injured or substantially injured students. Furthermore, within the three-month period before and during injury occurrence, a significant linear effect of stress scores increasing across the time periods was found for all injuries and substantial injuries, with the highest scores in the injury period. However, more research, especially into the effect of varying stress levels on injury risk, with higher frequencies (for instance with weekly measurements) is needed. For now, better management of workload and a focus on the possible effects of dance students' stress levels by including psychological training programmes aimed at reducing stress levels, for instance based on mindfulness, might have the potential to reduce the burden of dance injuries and may have positive outcomes for dancers, teachers, schools and companies.

Chapter 6.

Contemporary dance students' psychosocial responses during injury rehabilitation: a qualitative study

van Winden, D., de Kruif, A. J. Th. C. M., Savelsbergh, G. J. P., Oudejans, R. R. D., & Stubbe, J. H. (submitted). Translational Sports Medicine.

Abstract

Injury risk is high among dancers. However, in-depth studies on the psychosocial factors of injuries are currently lacking. Understanding how dancers' cognitive appraisals and emotional and behavioural responses interact during rehabilitation can help dancers and their environment to manage injuries. The objective of this study is to explore contemporary dance students' psychosocial responses during rehabilitation of an injury through a qualitative study design. We collected data by conducting semi-structured interviews (M duration = 87.6 minutes, range 50 – 105). Sixteen full-time students (M age = 20.65, range 18-26; 81% female) from two different European dance institutes were interviewed. All were substantially injured for at least one week during the previous academic year. Thematic analysis resulted in two main themes, namely 'dance beliefs' and 'coping behaviours'. Dance beliefs were categorized into the meaning of dance, influences of the dance environment and the interpretation of hard work and pain. With regards to coping behaviours, strategies to continue dancing and strategies to (mentally) feel better were mentioned. The dancers' beliefs regarding the demanding and performance-focused culture of dance and its schooling system resulted in highly perceived pressure, which influenced strategies to continue dancing. Furthermore, difficulties in coping behaviours, such as uncertainty about their injury course, and injury management, in which students adjusted their coping behaviours and indicated learning points, were mentioned. Students learned the importance of (body) awareness, having a positive mindset, social support and focusing on their future health. However, more education is needed on these aspects for both students and their teachers.

Introduction

Contemporary dance students participate in long hours of class, rehearsal and performance (Kenny et al., 2016). As well as physical training stressors, psychosocial stressors (such as upcoming performances and relationships with choreographers or other dancers) may likely influence dancers' mental and physical abilities to perform by increasing the demands placed on their bodies and minds. This can also strongly influence the necessary recovery time (Grove et al., 2013). These demands make a pre-professional dancer prone to health-related problems, which can be highly disadvantageous and lead to hindered artistic development (Kenny et al., 2016).

The dance science literature shows that injury incidence proportions (IP) are high. For instance, among pre-professional ballet and contemporary dancers, the annual IP ranged from 78 to 86% (Kenny et al., 2018; Lee et al., 2017; van Winden et al., 2019). As such, dancers are at a high risk of sustaining an injury (Kenny et al., 2016).

Injuries can result in different responses. According to the 'integrated model of response to sport injury' from Wiese-Bjornstal and colleagues (1998), pre-injury factors (e.g., personality, coping resources and history of stressors) can influence subsequent cognitive, emotional and behavioural responses to an experienced injury. A recent qualitative study demonstrated that Irish dancers experienced significant psychosocial challenges while suffering from injury (Higginbotham & Cahalan, 2020). Dance injuries have been associated with higher levels of stress, anxiety, depression, anger, fatigue, confusion, sleeping problems and disordered eating (Adam et al., 2004; Mainwaring & Finney, 2017). Furthermore, initial emotional responses towards dance injuries are typically negative and merely develop into more positive reactions towards recovery (Mainwaring et al., 2001).

The culture surrounding dance has been shown to be demanding and performance-focused, with high pain tolerance and injury suppression (Mainwaring et al., 2001). For instance, few dancers seek medical attention when injured due to a fear of having to discontinue dancing (Liederbach et al., 2012). As such, it is assumed that dancers do not fully recover from their initial injury. While having an injury history cannot be changed, the importance of rehabilitation prior to returning to full dance training might be a key ingredient in the education and injury prevention of young dancers (Kenny et al., 2016).

Recently, more attention has been given towards approaching injury rehabilitation from a psychosocial perspective, instead of only emphasizing the physical aspects, as is traditionally done within dance science (Mainwaring & Finney, 2017).

However, there is still very limited research available within the literature. Although a number of studies have shown that psychological constructs might affect injury rehabilitation and outcomes (Mainwaring & Finney, 2017; Reardon et al., 2019). Therefore, the aim of the current study is to explore contemporary dance students' psychosocial responses during rehabilitation of a dance injury.

Understanding contemporary dance students' cognitive appraisals, emotional and behavioural responses and how these interact during rehabilitation can help health professionals and dance teachers to both comprehend and relate to pre-professional dancers during injury rehabilitation. In particular, gaining insights into behavioural responses can increase the opportunities to implement injury management techniques for contemporary dance students and in their surrounding environments.

Methods

Design

A qualitative explorative study was conducted using semi-structured interviews with 17 contemporary dance students. By incorporating a qualitative study design with an epistemological constructionism approach (B. Smith & McGannon, 2018), we were able to focus on the dancers' subjective understanding and interpretations of their injury experiences and as such, to comprehend the injury experience from the dancer's personal perspective.

All students were informed about the procedure and provided written informed consent in accordance with the Declaration of Helsinki. Ethical approval for the study was provided by the Scientific and Ethical Review Board of the Faculty of Behavioral and Movement Sciences, Vrije Universiteit Amsterdam (VCWE-2020-109).

Population

Both male and female contemporary dance students (83% female) from two different full-time pre-professional dance education institutes within Europe were recruited. The inclusion criteria required that students were either (1) in an educational programme of Dance or Dance Teacher, (2) in their first, second or third study year, and (3) substantially injured for at least one week over the previous year (2019-2020), leading to reductions in training or performance. An injury was defined as any physical complaint sustained by a dancer as a result of dance activities, irrespective of the need for medical attention (van Winden et al., 2019). Potential participants were identified by the on-site physiotherapist or, if not available, the course secretary.

Students were subsequently approached by one of the interviewers through email and asked if they would be willing to voluntarily participate.

Purposive sampling was used to select participants that had experienced a dance injury (the phenomenon of interest) in order to obtain a sample of students with variations in sex, ethics, dance background, injury location and severity, alongside dance institute, educational programme and study year (J. Green & Thorogood, 2018). One student was excluded from the data analyses as their main complaint originated and developed differently than expected, having not been provoked through dance activities. Therefore, the recovery process deviated from that of the other students.

Data collection

Semi-structured interviews were used, as they are effective in understanding stories through the rich, in-depth and complex data that they can generate (Corbin & Strauss, 2008). The interviews followed a consistent structure through an interview guide (see Appendix), which was created based on existing knowledge and a complementary literature search. The framework for the interview guide was based on the integrated model of Wiese-Bjornstal and colleagues (1998) and previous research within sports (Clement et al., 2015). Examples of topics that were included are: degree of dance background, course of the injury, cognitive, emotional and behavioural responses to injury, injury impact, social support and lessons learned (e.g., "How can you use this experience in life and on stage?"). Detail-oriented, elaboration, and clarification probes were used to develop a deeper understanding of the participants' experiences and the contexts in which they occurred (Sparkes & Smith, 2014).

The interview guide was reassessed after the first two interviews, as these interviews showed that the personal perception of dance could shape students' reactions after injury. Therefore, the topic list was expanded with the addition of 'meaning of dance'. Furthermore, 'advice to either health care professionals or dance academies' was added, which resulted in a more comprehensive reflection during the following interviews.

The first two participants were interviewed face-to-face in a private, quiet location (e.g., separate studio within the institute). Due to the COVID-19 pandemic restrictions, the following 14 interviews were conducted via digital devices for video conferencing (e.g., Skype or Zoom). Students of institute one were interviewed by the first researcher (DW), while students of institute two were interviewed by a medical intern.

At the start of each interview, the interviewer explained the nature of the study and followed the informed consent procedure. All participants gave consent for the use of a recording device. Data collection took place between March 2020 and September 2020.

The interviews lasted between 50-105 minutes (M = 87.6 minutes) and were held in the educational programmes' main language, which was either English or Dutch. The first 11 interviews were transcribed verbatim, whilst the last 5 interviews were only transcribed, based on advancing insight in the data. Participants were reimbursed with a gift voucher of €10.

Data analysis

The transcripts were analysed using a thematic approach (Braun & Clarke, 2008), which generates rich descriptions of the data by identifying, analysing, interpreting and reporting common patterns or themes derived from the data. The analysis was performed through several phases of manual coding and with the use of Atlas.ti version 9 by the first researcher (DW). The findings were discussed via peer-debriefing until a preliminary framework was reached. Through subsequent axial coding, the labels were interpreted and clustered into main themes with accompanying sub-themes. Furthermore, the essence of each theme was identified through selective coding, whilst similarities and differences both within and across respondents were considered through constant comparison. The framework of themes and the preliminary conclusions based on this analysis were thoroughly discussed amongst DW as the main researcher and an expert on human movement science and sport psychology with training in qualitative research, AK as an experienced qualitative researcher and JS as a professor of performing arts medicine.

Memoing was done throughout the coding process with the recording of insights, connections, patterns and understandings, which facilitated the analysis and enhanced methodological rigor. Furthermore, the trustworthiness of the data was established by peer review, participant checking, and reaching a triangulated consensus amongst the researchers. AK and JS peer-reviewed the themes to ensure they were consistent with the transcripts, settings and research question. To ensure further validity, participant checking was used to give the respondents the possibility to confirm the credibility of the information and narrative account (Creswell & Miller, 2000). The students received a summary and were asked if they recognized themselves in what was written and whether they felt their story had been accurately expressed. All of the students confirmed this, with a few minor additions. Finally, descriptions of the environmental context and relevant quotations were included to strengthen transferability of the findings.

Results

The student populations of both European contemporary dance institutes and within both educational dance programmes (professional Dance or professional Dance Teacher) consist of young adults (minimum age = 16), with a wide variation in nationalities, cultural and dance-specific backgrounds. The classes and interviews were held in English, in line with the international emphasis of the dance field, with the exception of the Dance Teacher programme at one of the institutes, which is given in the home country language (i.e., Dutch). Overall, most of the students indicated some form of previous health history, while more than one-third of the students had sustained multiple injuries during the previous academic year. For specific demographic characteristics of the participants and injury characteristics, see Table 6.1.

The analysis led to the emergence of two main themes: dance beliefs and coping behaviours, with subsequent sub-themes, as shown in Figure 6.1. In reporting the themes, we used participant quotes to illustrate the results.

Table 6.1 Participants and injury characteristics

Participant characteristics	
N	16
Institute: 1 / 2	9 (56%) / 7 (44%)
Educational programme: Dance / Dance Teacher	8 (50%) / 8 (50%)
Study year: first / second / third	6 (38%) / 5 (31%) / 5 (31%)
Sex (female)	13 (81%)
Age (years)	20.65 (18-26)
Nationality:	
Dutch/Belgian	7
Australian/British	2
German/Swiss	2
Other	5
Injury characteristics	
Total number of current injuries	24
Injuries per student: one / two or more	10 (62.5%) / 6 (37.5%)
Previous injury history: yes / no	14 (87.5%) / 2 (12.5%)
Injury onset: acute / gradual	6 (25%) / 18 (75%)
Injury location:	
Shoulder	3
Spine/Hip region	4
Knee	4
Shin	2
Foot/Ankle	11

* All data are presented as either a mean (range) or number (%).

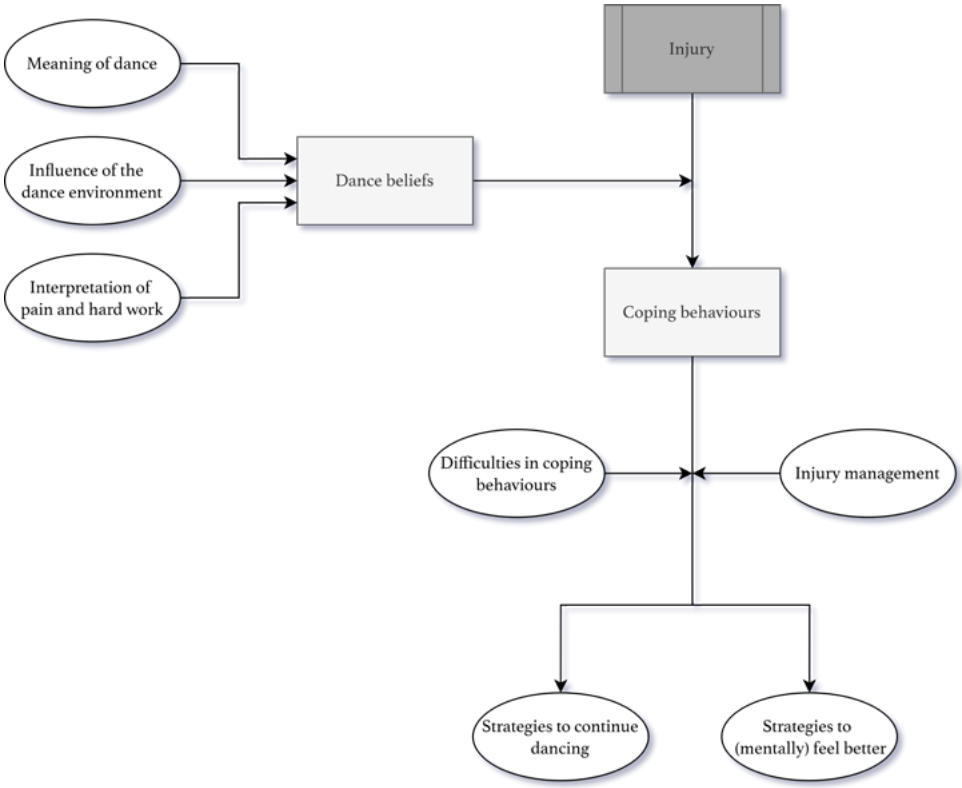


Figure 6.1. Psychosocial responses of substantial injuries among contemporary dance students

(1) Dance beliefs

The beliefs students had about dance and their dance environment were related to their psychosocial responses during the injury rehabilitation process. Within this theme, the meaning of dance, influences of the dance environment and the interpretation of hard work and pain were mentioned as sub-themes.

(a) Meaning of dance

Overall, for the respondents, dance is a way of expressing themselves. However, this strong connection can be perceived as too intense and results in difficulties when sustaining an injury:

> "It's just a free form of feeling and expressing yourself and I don't think when I dance. [...] you don't have to deal with whatever is happening in the world. [...] [feeling after injury] that was gone. Not having that free sense was hard. (cries)"
> *(third year Dance student, institute two)*

(b) Influences of the dance environment

Respondents indicated that the dance environment influenced the ways they reacted to an injury.

One important aspect leading to pressure was the nature of the school system, in which good grades and finishing within a time limit are required. Furthermore, there was variety in the way that teachers' reacted towards their injuries. A number of them were supportive, possibly even coming across as too cautious, whilst others were frustrated or even overlooked injured students. This resulted in further pressure for the students:

> "It really depends on the teachers. [...] So, it's really hard for us, as injured persons, to know what to do in the class. That's when dancers push themselves so much because I think I can't sit down they're going to tell me off if I sit down."
> *(third year Dance student, institute two)*

Moreover, students indicated they felt different, less strong or less dignified during their injury period. In particular, students experiencing chronic injuries felt that they were being held back by their dance environment:

> "Being labelled as an injured dancer hinders me sometimes, for example with teachers who knew me from last year and who were teaching a new dance style. [...] She assumed that I executed a certain dance move differently due to pain complaints, but I didn't have any pain. [...] that I'm being judged differently because they see me as an injured dancer, and not getting a fair chance compared to my classmates."
> *(second year Dance Teacher student, institute one)*

Constant comparison with classmates who should be in the same phase of development led to increased pressure and insecurity. Having to sit out in class whilst watching classmates continue and having fun, and not being able to participate in group projects was really hard for a number of the students and made them feel stuck, side-lined and insecure:

> "After a while, the physio said that I shouldn't come to school for full days anymore, but yeah... I wanted to, since I felt responsible for my class. I felt like, if I'm not there they will think I over-exaggerate. And I was afraid that would lead to distance between me and the class. A few students either quit or had to repeat the year due to injuries and not having that connection anymore was something I absolutely did not want."
> *(third year Dance Teacher student, institute one)*

While being at home made others feel like the injury had taken over their entire life:

> "...I can't relax if I'm at home doing nothing because then I feel how real it is that I can't dance. When I go to school and I watch and try to learn the choreographies, I'm still doing who I am and I'm still continuing, instead of sitting at home and concentrating on the feeling that I can't dance anymore."
> *(third year Dance Teacher student, institute two)*

(c) Interpretation of hard work and pain

Students indicated that the general idea within the dance culture has been that hard work is necessary and being in pain is unavoidable; they strongly felt the urge to always give maximal effort, were not able to take sufficient rest and kept crossing their own boundaries. However, other students tried to rebuke this general idea, and indicated that pain and injuries act as a penalty or warning signal:

> "The general idea that working through pain means you deserve praise or that's when you're a good dancer is the biggest crap that you can imagine [...] There's this glorification of pain, of exhaustion, of just generally being a workaholic and not doing anything for your emotional and physical health, I hate that. It's not good. Pain is pain, it's there for a reason, to tell you to stop doing that. That's what I would change."
> *(third year Dance Teacher student, institute two)*

Furthermore, the impact of pain and injuries on their mental state was also mentioned:

> "... as soon as you start to miss things because of an injury then your mindset goes as if it is also injured. [...] The more injured physically you feel, the more your brain is just like I don't want to do this."
> *(third year Dance student, institute two)*

A number of the students indicated having a history with mental health issues, either with diagnosed disorders or with more 'general' difficulties of dealing with emotions and feeling insecure, which impacted the way they experienced their current injury:

> "... with the anxiety disorder there comes a lot of ruminating thoughts, which are not really healthy. So, when you're injured and you have to sit down, then you realize what your thoughts are and you don't have this filter to run like: 'I feel bad now I'm going to dance' [...] I think it's the fear that something bad will happen or that I will get a bad diagnosis again that made me postpone everything, so yeah, the anxiety definitely did influence the recovery process."
> *(third year Dance Teacher student, institute two)*

(2) Coping behaviours: acting around your injury

Coping relates to the ways that students deal with their injury period. Different sub-themes were seen within these behaviours, namely: strategies to continue dancing, strategies to (mentally) feel better, difficulties in coping behaviours and injury management.

(a) Strategies to continue dancing

Students indicated that they employed different strategies to continue dancing, at least for a while. Overall, they tried to ignore, resist or postpone taking time off and recovering sufficiently from their injury. This was sometimes motivated because they hoped the pain would fade away or because they had (academic) goals to reach:

> "... of course when you start to feel pain complaints you first ignore it and pretend it does not exist. [...] I waited until after my exams and the holidays to visit the general practitioner, since I knew that when I did visit the GP he will say I have to quit dancing or stop doing certain movements. And that was something I did not want, I just wanted to finish everything and get my study credits."
> *(third year Dance Teacher student, institute one)*

Some students tried to adjust their movements in order to try and compensate for their injured and painful body part:

> "... in contemporary you can cheat a lot. If you're moving you can move faster or you just go over this movement a bit quicker to not stand too long on this foot so it was a bit easier to fake it."
> *(first year Dance student, institute two)*

Multiple students also indicated that they pushed themselves to dance, hoping to not feel negatively anymore:

> "And then I started to participate a little bit more each time. [...] Maybe a bit too enthusiastically. [...] The swelling was there for a long time, which was not necessary. [...] But after all, I still would find it hard when the physio would say 'You are injured, you need to rest and sit down for at least two weeks.' "
> *(second year Dance Teacher student, institute one)*

Finally, a number of the students mentioned that they have to get used to the pain and the limitations imposed in order to keep dancing. They tried to find a way to move forward with the more chronic nature of their injury and normalized these sensations:

> "... I made up my mind and said to myself 'Okay, I have to do one more academic year after this one. I will just finish it, with or without pain.' "
> *(third year Dance Teacher student, institute one)*

(b) Strategies to (mentally) feel better

Students indicated that having a positive mindset, instead of self-doubt and being negative, was an important method to uplift themselves during the injury and recovery process, to the same extent as being able to listen, feel and understand their body:

> "You don't have to feel bad about yourself because you always do your best. [...] you have to be so 'on goal' and patient and really open to the idea of 'OK it's gonna take this much time to recover from an injury.' Well. You don't really have a choice, just to accept it."
> *(third year Dance student, institute one)*

Furthermore, multiple students mentioned that keeping your mind busy with something else was very helpful in avoiding straying into negative thinking. Focusing on learning new skills and setting and working on goals, while noticing and tracking their progress, was very important. However, focusing on their recovery was also essential, leading to a type of contradiction for a number of the students:

> "... it is quite difficult. [...] I'm trying to keep my mind away because then my mindset stays better. So, the more I am not focusing on my injury then the better I feel but then I also need to focus on it to make it better in a way [by doing exercises and rest]."
> *(third year Dance student, institute two)*

Students also pointed out the need to feel in control during their recovery process. Overall, they had a hard time 'just' resting and limiting their dancing activities. They felt the urge to actively work towards recovery, for instance, by completing physiotherapy exercises provided by health care professionals:

> "Because of all the limitations I just felt really stuck. And I just didn't know how to overcome that. So for me it just felt like a wall that is just impossible to climb. [...] the doctor and her plan of treatment were amazing. It felt a lot better to do things, which is also why you came here [the dance institute] in the end."
> *(third year Dance student, institute two)*

However, some students indicated that rest, especially at the beginning of their recovery period, was actually pleasant:

> "... the first two weeks were actually very pleasant. As, I finally could just sit down, relax and watch my classmates. [...] Just rest, and not being obligated to present and stand in front of a group the whole time and prove yourself."
> *(second year Dance Teacher student, institute one)*

Using an individual approach that is most suited for your body was important for the students, although, being in a school environment with basic rules for everyone made this more difficult. Therefore, understanding your own feelings, needs and taking care of your body, while not getting distracted by the opinion of others, was necessary:

> "I wished I listened to my body a bit more. Really listen to what it needed instead of doing what others asked me to do. [...] There were a few periods in time that I crossed my own boundaries because I just wanted it so badly. I wanted to do the stuff my classmates did as well. But overall that was not very smart, and resulted in partially slowing down my recovery."
> *(second year Dance Teacher student, institute one)*

Finally, students indicated that they felt better when they received support from a range of resources, such as friends, classmates, family, health care professionals and, for some, also the schoolboard and teachers:

> "Through the support system I had I gained more head space. The encouragement that was given to me was like 'it's gonna be okay' so I thought 'yes, it is gonna be okay. I just have to make plans.' I had a lot of visits from friends when I was stuck in bed after school. They would come, brought up my dinner and stuff like that."
> *(first year Dance student, institute two)*

However, not all of the students felt encouraged by these same resources or in the same way:

> "... turning to people for support is not really helpful. When somebody has encouraging words or listens to you if you have troubles it's definitely nice, but it's always this look on everybody's faces: I would love to help you but I don't know how."
> *(third year Dance Teacher student, institute two)*

(c) Difficulties in coping behaviours

Students often indicated that they experienced difficulties when coping with their injury. A number of students reported struggling with accepting their injury and listening to the limitations that were needed to recover. Experiencing pain during dancing, but especially in daily life, made this even more difficult, resulting in negative emotions. A few of the students reported taking their initial signs of pain seriously from the beginning and promptly acted upon these signals, while others indicated that the transition to eventually stop dancing for a while and take sufficient rest was not easy:

> "... it was my biggest struggle to accept that I have to do something now before it gets like chronic or worse"
> *(first year Dance student, institute two)*

Furthermore, for some students it was difficult to cognitively understand and listen to their body, making it harder to effectively guide their coping behaviours. They occasionally felt like they had imagined the pain in their minds, especially when no specific diagnosis could be given. When they started to increase the intensity of their dancing, making them question their actual symptoms and necessary limitations. Alongside this, a number of the students perceived that their physical and mental recovery processes proceeded at different paces, making it even harder to interpret pain signals:

> "... I thought, maybe I just need to dare to put my body in certain positions and see what will happen, but yeah, it still hurt... [...] I know that it will not get any better when I cross my limits. However, your body also needs to get used to it, otherwise it makes sense that it hurts."
> *(second year Dance Teacher student, institute one)*

Furthermore, having uncertainty about their recovery process was often mentioned by students. Not knowing how their injury would develop or even what diagnosis explains their symptoms also resulted in negative emotions. A number of the students were overwhelmed by the severity of their injury, resulting in frustration, anxiety and insecurity:

> "... it never really happened before to me. So, I was scared it would become a chronic injury or something [...] You really don't know how your body is going to react to the injury and how it's going to recover from it."
> *(third year Dance student, institute one)*

Additionally, a few students mentioned that this uncertainty surrounding their recovery made it harder to receive or ask for the understanding and support from their environment that they needed:

> "That whole period was so unclear. And then you need to tell a teacher that you can't participate because you're in pain. To what extent are they going to believe you after two months? [...] I felt like, yeah I don't really have anything, I'm in pain and can't participate but actually I have nothing [...] I was just so relieved that the diagnosis became clear and that I could work with that."
> *(third year Dance Teacher student, institute one)*

Overall, students felt pressured by the conflicting feelings of needing time to recover and slowly and steadily build up their dancing intensity, but also facing the time lost in their development as dancers whilst their classmates continued. Although a number of students tried to use their spare time to work on other aspects when they could not participate in class, it was a challenge:

"... I was really happy to be able to do other stuff. During the class I did my little workout and stretch for myself. [...] Just take my time. At the same time an injury is bad because it is like a penalty, you cannot dance. But it also gives you time to find other stuff to do, to re-centre yourself."
(third year Dance student, institute one)

Being embedded in a school system made this even harder:

"It was a bit frustrating to not to be able to do everything right away. [...] especially that I missed so much in ballet, because I'm not the best ballet dancer. I don't have so much experience. They were already so far away from the level I was. [...] like I'm never going to catch up, possibly I cannot even do this anymore. So, this was also making me frustrated and worried"
(first year Dance student, institute two)

Lastly, a few students indicated that they experienced fear of movement and were afraid to fully start dancing again:

"... you have to assess for yourself what you can and can't do and [becomes emotional] obviously, I became afraid. [...] I'm also aware that because I can't visualize myself doing certain movements, I'm more likely to do something wrong. And even if that is not true, I have it in my head now. [...] there is always some anxiety when we jump."
(second year Dance Teacher student, institute one)

(d) Injury management

In general, students indicated the need to manage their injury coping behaviours by noticing the consequences and learning points from their injury and adjusting their behaviours where needed. They used their injury process to learn which aspects helped or hindered recovery, which aspects could positively influence their dancing career, to realize what they have and what dance meant to them:

"... I can use this experience to learn. If you sit back for a minute and just watch what you are doing, it's kind of like this is what I'm doing all year, this is what I want. I feel like sometimes you just have to take a few steps back and look at the bigger picture of everything."
(first year Dance student, institute two)

For some students, the meaning they attached to dance was strengthened, becoming more fundamental and holistic after being injured, while for others the meaning that dance had for them diminished due to their injury period:

"Dance used to be an addiction, but I didn't see it as an addiction at the time, I've only recently figured that out. Everything was dance, that was my life. [...] Now, because of the injury, I've learned that I not only identify with dance but that I have a lot more interests. It doesn't determine my life anymore. Now, I can more easily say no to dance."
(third year Dance Teacher student, institute one)

As a result, students indicated that they had grown as a person, both within their personality or their overall behaviours:

"... Maybe it also affected my personality. I do think it's made me tougher towards myself, gave me more perseverance, not giving up so quickly."
(second year Dance Teacher student, institute one)

Students also indicated that they have learned to focus more on themselves instead of the dance environment, by increasing their body awareness and control. The injury helped them to not only know their limits and abilities, but also to choose more consciously to take care of their body:

"I kept going even though I was in pain until someone said 'No now you have to go and sit aside.' [...] I used to be like, I just want to participate. Let me participate. But now I'm like, you have to take care of your body. [...] Since I'm here, it has also become clearer to me that I still have to do a lot with my body and it is also important that as a teacher you can be healthy in front of a class and not injured"
(first year Dance Teacher student, institute one)

Additionally, after their injury, a number of students focused more on incorporating a healthy lifestyle by trying to work in sustainable ways with their body and energy levels, and learning about healthy performing:

"... it also motivates you. Because when you're recovered from your injury, you think about it from time to time or you see classmates who are currently injured and you think 'I definitely don't want that anymore so I'm going to do my exercises regularly, go to bed on time and eat healthy food.' [...] I have learned to deal with my body sustainably."
(second year Dance Teacher student, institute one)

Some also stated that others, for instance, teachers or health care professionals, could help them with managing their injury better by helping them to gain a better understanding of their body, learning how to take care of their bodies and pointing out the consequences of an injury:

"The physios at school will also continue to follow you until you're complaint-free. [...] this also helps to know what to do, what is best for your body. If they just let you go, a lot more people will injure their own bodies by just going on. The physio's will make sure you listen to your body."
(first year Dance Teacher student, institute one)

Students also mentioned that they have learned the importance of having a positive mindset, setting and working on (different) goals, being relaxed, patient and taking time to recover when needed:

> "... I was trying to make the best out of it, I was trying to stretch my weakness, everything that I was not so good at before I tried to work on. [...] I really tried to stay positive and that's what I think I learned about it, seeing everything black and dark and sad is just not the way out of something."
> *(first year Dance student, institute two)*

While others indicated how learning to (actively) control their injury, subsequent thoughts and emotions, and making their own choices regarding their recovery process helped them:

> "I learned how to deal with the situation of not feeling great, physically and then mentally. To just control it. Earlier it was like 'No I want to change, I have to get out of this. I have to do something different, I have to leave or I have to...'"
> *(third year Dance student, institute two)*

Finally, multiple students indicated the importance of support, in particular, receiving help with daily tasks, but also the advice of a health care professional. However, a number of students indicated that it could be hard to ask for support, as they did not want to burden those in their social environment. Therefore, being able to ask for help early on in the recovery process, having a social support system or another passion to fall back on when you are injured became important learning points for some students:

> "... it would be good to have a community or have something to catch you in case the injury happens again, that you have friends which are artists so they know what you're talking about. Or you also have this other thing you're working on which is still connected to your dancing. This does not mean that I want to do it instead of dancing, but I still have it in case I have a phase of injury and I can do this so it distracts me a bit."
> *(third year Dance Teacher student, institute two)*

Discussion

The purpose of this study was to examine psychosocial responses to substantial injuries within contemporary dance students. During semi-structured interviews, participants reported their behavioural responses and mentioned the emotions and cognitions they experienced throughout the injury period. Two main themes were identified: 'dance beliefs' and 'coping behaviours'. The beliefs surrounding dance showed the important cognitive appraisals that arose during the injury process around the meaning of dance, the influences of the dance environment and the interpretation of hard work and pain. Overall, students showed two types of coping behaviours: strategies to continue dancing and strategies to (mentally) feel better. It could be noticed that the strategies engaged to continue dancing were less constructive and could lead to possible long-term consequences. Nevertheless, they were applied extensively, mainly as a result of the perceived high pressures from the environment. In addition, difficulties during coping with an injury were mentioned. Furthermore, aspects regarding injury management have been indicated by students and allowed them to adjust their behaviour based on the consequences of the injury, partially as a result of feedback from teachers or health care professionals, or because the injury complaints did not dissipate (fast) enough. These aspects resulted in specific learning points. Overall, our results illustrate that cognitive (and emotional) factors (e.g., dance beliefs) can influence injury-related coping behaviours, as stated by the 'integrated model of response to sport injury' of Wiese-Bjornstal and colleagues (1998), illustrated in Figure 6.1.

The effect of cognitive appraisals on coping behaviours

In line with the literature, our results showed that the sociocultural context in which an injury occurs has implications for the psychological responses that emerge (Bolling et al., 2018; Wiese-Bjornstal et al., 1998). Social support made students feel less insecure about their injury process and their ability to handle it. However, the majority of students experienced feeling pressured, which negatively influenced their emotions and behaviours. The 'demanding and performance-focused culture of pain tolerance and injury suppression' was well established in the dance literature almost 20 years ago (Mainwaring et al., 2001). Yet, in agreement with more recent literature (e.g., Grove et al., 2013; Higginbotham & Cahalan, 2020), our results indicate that this specific culture is still present.

Coping strategies engaged to continue dancing were (indirectly) stimulated by the dance environment, for example, the dance culture and the school system, due to the fear of exclusion, constant comparison with classmates and the time pressures of finishing their education. Students overemphasized the short-term benefits (e.g., being able to dance) instead of the long-term consequences (e.g., insufficient injury recovery).

Furthermore, the students found the variations in teachers' reactions to their injury difficult, as they did not know if they could depend on their teachers for support when needed. Specifically, the subjective interpretation and beliefs about their teachers (e.g., cognitive appraisal) influenced their behaviours. No distinct differences or patterns were noticed between institutes, educational programmes or study years, which also highlights the subjective perception of the external pressures. Overall, our results might indicate, in agreement with previous literature, that injured dancers continue to dance, feel pressured to hide their injuries, or hasten their return because they perceive that 'others' expect them to continue to work through the injury. This can result in disturbing health consequences (Higginbotham & Cahalan, 2020; Mainwaring et al., 2001).

Furthermore, students often mentioned their personal relationship with dance, known as their dancers' identity. The literature shows that any barrier to self-expression and movement, such as an injury, can be interpreted as a threat to an individual's identity, especially when the activity serves as an important source of self-worth (Mainwaring et al., 2001). The students' over-identification (e.g., cognitive appraisal of dance) could have resulted in a 'disrupted sense of self', increasing the experience of pressure and, thereby, prompting the use of strategies to continue dancing. In contrast, being 'normally' engaged in dance could help students approach their injury in a positive way by maintaining a positive mindset, being in control and listening to their body.

The cognitive appraisals of pain also influenced how students behaved. Some indicated accepting and downgrading their pain in order to 'just' continue dancing. This is consistent with the dance culture which, at times, has revered pain and injury as crucial elements for the development of artistic sensitivity (Rivera et al., 2012). However, accepting pain, and thereby ignoring injuries, over a longer period may affect the body's alarm system, risking more serious injuries or chronic pain problems (von Rosen et al., 2018). Other students indicated that pain and injuries acted as warning signals and were an important aspect in setting boundaries. Pain helped them to focus more on the long-term consequences of their injury and dance activity, by (better) listening to their bodies, learning from this experience and being more gentle with themselves.

Multiple students learned throughout their injury process to become more aware of their body's needs and appraised their pain differently. Yet, these students were conflicted between taking good care of their body and keeping up with the 'old' culture of working through the pain. Overall, students indicated a discrepancy between the feeling that they needed time to recover, but also feeling that they had lost time to develop as dancers. Alongside time pressures, uncertainty about their injury course

also negatively impacted their emotional responses and resulted in less constructive behaviours. Consistently, the sports literature has indicated that greater emotional disturbance has been related to higher levels of avoidance-focused coping (Gallagher & Gardner, 2007) and lower levels of constructive coping strategies (Wadey et al., 2013).

Injury management

Having the risks of continuing to dance highlighted by health care professionals or teachers, as well as realizing their injury complaints were not healing sufficiently, could help students to manage their injury and focus on the long-term consequences by changing their behaviours towards strategies to (mentally) feel better. Generally, these coping strategies were focused on being able to listen to, feel and understand their body better. Dancers improve at interpreting, predicting and understanding their bodies and the predictors of potential injury as they become more experienced (Tarr & Thomas, 2011), indicating the importance of learning from their injury management. Overall, the students noted the importance of (body) awareness, having a positive mindset, social support and focusing on their future health as learning points from their injury process.

Some students stated that you need to go through an injury in order to learn how to cope, making it a 'necessary' learning experience. As such, a form of finding the benefits could be observed, referring to a reported positive life change resulting from the struggle to cope with a challenging life event. In line with this, sports injury-related growth enables injured athletes to transform their injury into an opportunity for growth and development (Roy-Davis et al., 2017). In our study, most students indicated experiencing a form of growth, for instance, with finding a greater purpose and appreciation of life (e.g., changed meaning of dance), personal strength (e.g., resilience, personal growth), better body-self relationship (e.g., listening, understanding and being more compassionate of one's body) and by learning the importance of their social relationships (Roy-Davis et al., 2017). It is important to be aware of the students' beliefs that an injury is an essential learning experience for each dancer. However, preventively teaching coping skills to replace potentially harmful coping mechanisms may have better results (Pollitt & Hutt, 2021).

Practical implications and future research

Alongside the limited timeframe for achieving their artistic and academic goals and the financial implications of injury (Weigert, 2005), students often have insufficient knowledge to manage injuries by themselves (Mainwaring et al., 2001). Therefore, the main implication of our results is to teach contemporary dance students more about pain appraisal, body awareness, the influence of their thoughts and emotions on their behaviours and the importance of reinforcing their own boundaries.

In line with the indicated learning points of the respondents, educational interventions on the relationships between pain and normal (sport) participation, with transparent communication about injury risks and causes, could lead to increased body awareness (von Rosen et al., 2018). In addition, somatic techniques, such as Pilates, Alexander Technique or the Feldenkrais method, could further improve body awareness (Tarr & Thomas, 2011). Moreover, teaching students about the negative effects of stress and a lack of coping skills when dealing with injuries (Jacobs et al., 2012) can help them to balance the short-term benefits and long-term consequences of continuing to dance when stressed, tired or in pain.

Furthermore, dance teachers should be better equipped with handling injured students, for instance, by being taught about injury risks and causes (including how to build up the dancing intensity) and the psychological impact of injuries. For instance, students were often expected to watch or partly perform dance classes while injured. However, watching classes was hard for a number of the students and could incite negative emotions, such as guilt and depression (Johnston & Carroll, 1998), while others experienced it as more pleasant to keep going to classes. Therefore, giving students the autonomy to choose what they want to do during classes could help them cope better (Mainwaring et al., 2001).

Furthermore, positive support from the environment is essential, as students often perceived that 'others' expected them to continue dancing despite their pain and injury. For instance, actively listening to the student, asking questions about their thoughts and feelings, validating their emotional and cognitive confusion and 'disrupted sense of self', and reassuring them that taking time to recover is appropriate could all aid in comforting the student.

Directions for future research should mainly focus on factors that contribute to the 'demanding and performance-focused culture of pain tolerance and injury suppression', for instance, by incorporating the perspectives of teachers and health care professionals on injury. Moreover, appropriate forms of social support following dance injury, education and intervention strategies for psychological management of dance injuries should be further investigated to stimulate (cultural) changes within the new generations of dancers and dance teachers.

Strengths and limitations

The strength of this study lies in the enrichment and diversity of the stories told. The interviewed students had different backgrounds, came from different dance educations and institutions and had experienced a variety of injuries. The results were interpreted by experts from a range of backgrounds in order to better understand contemporary dance students and their psychosocial responses of injuries.

Although our results provided meaningful findings with regards to contemporary dance students' coping behaviours and beliefs, the study is not without limitations. The primary limitations of this study are related to the method of sampling. Students were selected through either an on-site physiotherapist at institute one or the course secretary at institute two, which could have a sense of bias as only one assessor had medical expertise. However, all of the students who met the inclusion criteria were assessed by the research team as well.

Furthermore, some of the participants were not native English or Dutch speakers and may not have been able to express their ideas as easily in these languages, even though the educational programmes have either English or Dutch as the main language. Moreover, despite our explanation of confidentiality at the beginning of each interview and the highlighting of our independent role within the institute, it is possible that a number of participants could have filtered their opinions, as students have a dependent relationship towards their institutions.

Finally, given the sample size and the different situational and personal factors, these results cannot be generalized to other dance settings, such as dance companies. Nevertheless, the contemporary dance students' psychosocial reactions towards substantial injuries are in line with previous research (Higginbotham & Cahalan, 2020; Mainwaring et al., 2001; Rivera et al., 2012).

Conclusion

In this qualitative study, we examined psychosocial responses as a result of substantial injuries within contemporary dance students. Our main results showed that coping behaviours were often influenced by the beliefs students have around the demanding and performance-focused culture of dance. Cognitive appraisals around this 'hard' culture and being part of a school system with a limited timeframe to achieve their goals, resulted in highly perceived (external) pressure and negative emotions. Generally, students showed constructive coping behaviour strategies to (mentally) feel better, but also non-constructive strategies to continue dancing as a result of this pressure. Time pressure and uncertainties about their injury course made it more difficult to effectively cope with their injury and listen to their body's needs. Overall, injury management was induced by feedback from others or insufficient recovery trajectories, in which students adjusted their coping behaviours based on injury consequences. Eventually, students learned the importance of (body) awareness, having a positive mindset, social support and focusing on their future health. Findings of this study will be used to implement or improve the necessary education on these aspects for both students and their teachers.

Appendix - Interview guide

Introduction

• Explain aim of the study, use of the results, Informed consent and recording.

• What to expect: you decide what you consider to be important to share. There are no wrong answers, you are the expert. There is no fixed question list. We will add additional questions if needed.

• Anonymous: quotes will be used in the final report, only recognizable by the participant themselves.

Topic list

Based on integrated model of Wiese-Bjornstal et al. (1998) and Clement et al. (2015). Dancer determines the thread through the interview. The topic list and example questions below function as a support material for the interviewer.

(1) Background
- a Personality: Could you tell me about yourself?
- b Dance experience: Could you tell me about your background in dance?
- c Ambition: What are your goals/dreams within dance?
- d Injury: Could you tell me about any major injuries from the past?

(2) Injury details
- a When: Could you tell me about the time when you got injured?
- b Injury characteristics: severity, diagnosis, duration, etc.

(3) Reactions directly after getting injured, after diagnosis and now:
- a Emotions (feelings): What did you feel?
- b Cognitions (thoughts): What did you think?
- c Behaviours (daily, pain reduction, rehabilitation): What did you do?

(4) Reflection
- a Impact injury: Could you explain how your injury has affected you? Daily life, personality, future.
- b Biggest challenge: What has been the most challenging aspect of being injured?
- c Social support: When you got injured, who did you turn to for support? What was the environment like?
- d Resources and blockages: Can you tell me anything specific that you feel has helped your recovery? And anything that hindered your recovery?
- e Lessons learned: How can you use this experience in life and on stage?

(5) Readiness for returning to perform
- a (Changed) ambition: Could you tell me about your goals (life and dance) since sustaining your injury? Did they change?
- b Motivation
- c Thoughts around returning to perform: What were your thoughts and feelings concerning returning to perform? If it were possible to do so, what aspects of your rehabilitation would you change (if any)?

(6) Meaning of dance: What does dance mean to you? Has your injury affected this?

(7) Advice: If you could give any advice to either health care professionals or dance academies considering injuries, what would it be?

Closure

- Introduce closure: "Is there anything we missed during this interview that you would like to add?"
- Ask for basic demographics (age, sex, study year, educational programme)

Chapter 7.

Prevalence of mental health complaints among performing arts students is associated with COVID-19 preventive measures

Stubbe, J. H., Tiemens, A., Keizer-Hulsebosch, S. C., Steemers, S., van Winden, D., Buiten, M., Richardson, A., & Van Rijn, R.M. (2021). Frontiers in Psychology, 12, 2284.

Abstract

The aim of this study was to investigate the effect of COVID-19 preventive measures on the mental health of performing arts students. In a prospective cohort study, performing arts students (N = 213) from Codarts Rotterdam, University of the Arts, were invited to monitor their health during one academic year (September 2019 – May 2020). Every month, students completed items on mental health complaints, stress, and sleep quality. Chi-square tests and repeated-measures ANOVA with deviation contrasts were performed to investigate whether COVID-19 preventive measures were associated with changes in mental health complaints, stress scores, and sleep quality. During the COVID-19 lockdown, subjective mental health, Mental Health Inventory-5 (MHI-5), and items on loneliness were additionally completed by the respondents. A total of 98 students (46.0%) were included in the analyses. The 3-month prevalence of mental health complaints was significantly higher during the COVID-19 lockdown compared to the two pre-COVID-19 periods ($p < 0.001$). Mean stress scores were significantly lower for February (35.20) and March (36.41) when compared to the overall mean (40.38). Sleep quality scores (mean) were significantly higher for April (6.90), and May (6.89) when compared to overall mean (6.58). Furthermore, at least 75.5% of the participants dealt with moderate to very severe loneliness in all 3 months during the COVID-19 lockdown. During lockdown, performing arts students perceived less stress and their sleep quality increased. However, the prevalence of mental health complaints increased. Besides, 3 out 4 students dealt with moderate to very severe loneliness.

Introduction

The coronavirus disease 2019 (COVID-19) has resulted in a global pandemic with unprecedented consequences. Governments are forced to implement measures to reduce the rapid spread of the disease. These measures range from recommendations on an individual level (i.e., using a mask, washing hands frequently, avoiding public contact, maintaining a safe distance between people) to strict collective prevention measures such as confinement and social isolation (Adhikari et al., 2020; Arefi & Poursadeqiyan, 2020).

A growing number of studies have investigated the psychological impact of COVID-19 on the general population (i.e., Fitzgerald et al., 2020), and specific target groups; for example, athletes (i.e., Pillay et al., 2020), children (i.e., Ghosh et al., 2020), adolescents (i.e., Imran et al., 2020), medical staff (i.e., Luo et al., 2020), older people (i.e., Sepúlveda-Loyola et al., 2020), patient groups (i.e., López-Fando et al., 2020), performing arts professionals (Spiro et al., 2021), and students (Elmer et al., 2020). The results have shown that mental health problems (i.e., anxiety, depression, and stress) are common reactions to the COVID-19 pandemic (Kunzler et al., 2021; Rajkumar, 2020).

To our knowledge, no study to date has investigated the effect of COVID-19 on mental health complaints of performing arts students. However, a recent cross-sectional study investigated the impact of the COVID-19 lockdown on the health, well-being, and livelihoods of professional performing artists (Spiro et al., 2021). In this cross-sectional study, data from a survey was analysed both quantitatively and qualitatively. The quantitative analysis of this study showed that 63% of the respondents reported feeling more lonely, and 85% reported feeling more anxious as a result of the public health situation. In their own words professional performing artists described that the lockdown had negative implications for health and well-being, including anxiety, low mood, worsening, or new symptoms of depression, unstable or fluctuating moods, and poor sleep.

In students, COVID-19-specific worries, isolation in social networks, a lack of interaction and emotional support, and physical isolation have been related to mental health issues (Elmer et al., 2020). Compared to the general student population, performing arts students might even be more affected by social isolation. Whereas, switching to online teaching is a good alternative for the general student population, for performing arts students classroom teaching is essential to interact with teachers and students to work on their technical and aesthetical abilities, as well as working together on specific performances. Furthermore, performing arts students spend most of their time at school. School days from 9 am to 6 pm are the rule rather than the exception.

A cross-sectional study among elite and semi- elite athletes found that suspending seasons and cancelling competitions, as a result of the COVID–19 lockdown, cause significant grief, stress, anxiety, frustration, and sadness (Pillay et al., 2020). The psychological impact of COVID-19 on performing arts students might be — just as in athletes — increased by the disruption of one's normal routine and social support network.

In the Netherlands, both personal and collective preventive measures have been taken to slow down the disease spread and prevent health systems from becoming overwhelmed. On March 15, 2020, the government closed public places such as educational institutions, bars, restaurants, cafés, and coffee shops. The peak of the epidemic was from late-March to early- April 2020. Performing arts students in the Netherlands were banned from all performing arts activities (classes, rehearsal, and performances), and were unable to attend classes at school from March 16 to June 15, 2020 (13 weeks). This study aims to investigate the effects of COVID-19 preventive measures on the mental health of performing arts students using a prospective design with monthly follow-up. We hypothesise that mental health complaints, stress, and sleep quality have been negatively affected by the COVID-19 preventive measures.

Materials and methods

Participants

All first-, second-, and third-year students (N = 213) of the Bachelors in Dance, Dance and Education, Circus Arts, and Music (specialisation Music Theatre) from Codarts Rotterdam (University of the Arts) were prospectively followed on a monthly basis during one academic year (September 2019 – May 2020). This monitoring is part of the students' educational programme to monitor their health and be more effective in learning and performing and taking responsibility for their own personal development. All students are enrolled in a 4-year educational programme, resulting in a Bachelor of Arts degree. Fourth-year students are not included in this study because they do not complete questionnaires as a result of their internships. All students were informed about the purpose and procedure of this study and provided written informed consent. The study was approved by the Medical Ethics Committee (MEC-2019- 0163) of the Erasmus University Medical Centre Rotterdam, the Netherlands. For the analysis of this study, we selected the students who completed at least all three questionnaires during the COVID-19 lockdown (March, April, and May 2020).

Data Collection Procedure

The Performing artist and Athlete Health Monitor (PAHM) was used to monitor the mental health of performing arts students (Karreman et al., 2019; Stubbe et al., 2018; van Winden et al., 2019). Every month, students were invited to complete a questionnaire concerning their physical and mental health during one of their theory classes. A reminder was sent to the students that were not present during these classes, and a second reminder was sent to all students who did not respond to the questionnaire after 1 week.

Measuring Instruments

PAHM incorporates several questionnaires and items and is accessible from personal computers, tablets, and phones. Table 7.1 gives an overview of the items that we used in this specific study.

Several questionnaires and items were assessed before (September 2019 – February 2020), and during the COVID-19 lockdown (March 2020 – May 2020). Firstly, the Oslo Sports Trauma Research Centre (OSTRC) Questionnaire on Health Problems (Clarsen et al., 2014; Stubbe et al., 2018; van Winden et al., 2019, 2020a); was included to assess the most severe mental health complaint. The OSTRC questionnaire consists of four key questions on the consequences of health problems for participation, training volume, and performance, as well as the degree to which the student perceived symptoms. Each question of the OSTRC was scored with a four- or five-point scale, ranging from 0 (respectively: no problem, no reduction, no effect and no symptoms) to 25 (cannot participate at all or severe symptoms). The severity of the health problem was calculated by the sum score of the four questions (0: no health problem – 100: cannot participate at all due to severe health problems), according to the method proposed by Clarsen et al. (2014). If the severity score was higher than zero,

Table 7.1: Overview of the items included in the questionnaires before and during the COVID-19 lockdown.

	Pre-COVID-19 period (Sep 2019 – Feb 2020)	COVID-19 period (Mar – May 2020)
Mental health complaint (prevalence)	X	X
Stress (0-100)	X	X
Sleep quality (1-10)	X	X
Mental health (1-5)		X
MHI-5 (0-100)		X
Loneliness (0-11)		X
- Sum score		X
- Emotional loneliness		X
- Social loneliness		X

a health problem was registered and the student was asked whether the health complaint was an injury, mental health complaint, illness, or other problem. Second, a visual analogue scale (VAS) was used to assess stress with scores ranging from 0 (no stress) to 100 (extreme amount of stress). The VAS is frequently used in stress assessment and several validity studies have highlighted its psychometric properties. The VAS is at least as discriminating as other stress scales (i.e., 14 items Perceived Stress Scale) (Lesage et al., 2011), shows satisfactory inter judge reliability (Lesage et al., 2011, 2012) and reliability (Lesage et al., 2009).

Third, sleep quality was measured using a single-item (i.e., How would you rate your sleep quality overall in the past 4 weeks?) on an 1 – 10 numeric rating scale (NRS), where 1 is worst possible sleep and 10 best possible sleep.

The sleep quality NRS have demonstrated strong psychometric properties, including reliability, validity, and responsiveness and is correlated with relevant aspects of the frequently used Medical Outcome Study (MOS) sleep scale (Cappelleri et al., 2009; S. Martin et al., 2009).

During the COVID-19 lockdown, several additional items were included in the survey. First, subjective mental health was measured with one single question on a scale ranging from one (excellent) to five (poor) (i.e., "In the past 4 weeks, would you say your mental health is..."), which was based on the first question of the 36-item Short-Form Health Survey (SF- 36) (Ware & Sherbourne, 1992). Second, the five-item Mental Health Inventory (MHI-5) — a subscale of the 36-item Short-Form Health Survey (SF-36) — was applied to assess mental health (Ware & Sherbourne, 1992). The MHI-5 comprises five items with six possible responses ranging from "all the time" (1 point) to "none of the time" (6 points). The final MHI-5 score is calculated by summing up the item scores and transforming this score to a scale varying from 0 to 100, with lower scores indicating more severe mental complaints. In the present study, a cut-off point of 60 was used (Thorsen et al., 2013). Participants with a MHI-5 score ≤60 were classified as mentally unhealthy and participants with a MHI-5 score >60 were classified as mentally healthy. Third, loneliness was assessed by the eleven item loneliness scale (De Jong Gierveld & Van Tilburg, 1999), with response categories of "yes," "more or less," and "no." The item scores of the loneliness scale were dichotomized in agreement with the scaling procedure (yes = 1; more or less = 1; no = 0). The total loneliness scale score was computed as the sum of the dichotomized items, ranging from 0 (absence of loneliness) to 11 (extreme loneliness). The following four categories were used: no loneliness (score <3), moderate loneliness (score 3 – 8), severe loneliness (score 9 or 10), and very severe loneliness (score 11) (Elmer et al., 2017).

Statistical Analysis

Statistical analyses were conducted using SPSS V.24 (IBM, Armonk, USA) and statistical significance level was set at an alpha level > 0.05. Descriptive statistics were used to describe characteristics of the study population (i.e., age, sex, educational programme) using mean and standard deviation (SD) or number and percentages (%). The response rate was calculated for the total student group (number of completed questionnaires/total number of questionnaires send out to students * 100).

Based on the OSTRC questionnaire, the 3-month prevalence of mental health complaints was calculated by dividing the number of students who reported a mental health complaint during a 3-month period by the number of respondents in the same 3 months. Chi-square tests were performed to investigate whether the differences between the two pre- COVID-19 periods — September to November and December to February — and the COVID-19 lockdown (March to May) were statistically significant. Besides, means and SD per month were calculated for stress and sleep quality. Repeated-measures ANOVA with deviation contrasts were performed to investigate whether stress and sleep quality scores in any of the pre-COVID-19 months (September – February) and the COVID-19 lockdown (March – May) significantly deviated from the overall mean.

Means and SD or numbers and percentages were calculated monthly during the COVID-19 lockdown (March – May) for subjective mental health, MHI-5, and the loneliness scale.

Results

Participants and Response Rates

A total of 213 students were invited to participate in this study. Nine students did not sign the informed consent and were excluded from the analyses. A total of 106 students did not complete all three questionnaires during the COVID-19 lockdown and were excluded from the analyses. This resulted in 98 students included in the analyses (46.0%). Of these, 32 students were enrolled in the bachelor course in dance, 32 in dance teacher, 25 in circus, and 9 in music theatre. The mean age of the students was 19.89 (SD = 2.0). Overall, 75.5% of the students were female. The 98 enrolled students were monitored on a monthly basis during one academic year (9 months) resulting in a total of 882 questionnaires (98 students * 9 months) sent during the academic year. Of these, 859 were completed leading to a response rate of 97.4% across the academic year.

Mental Health Complaints According to the OSTRC

The 3-month prevalence of mental health complaints was 21.4% (September – November) and 24.5% (December – February) during the two pre-COVID-19 periods and 27.6% (March – May) during the COVID-19 lockdown. This difference was statistically significant [$\chi^2(1) = 11.73$, $p < 0.001$ and $\chi^2(1) = 19.45$, $p < 0.001$].

Stress

Figure 7.1 displays the scores on the VAS stress scale. The average stress score was 40.38 during the pre-COVID-19 period and 37.66 during the COVID-19 lockdown. The assumption of sphericity was violated by Mauchly's Test of Sphericity [¬¬χ2(35) = 84.45, $p < 0.001$]. As a result, the Greenhouse-Geisser correction was used. There was a significant effect of time on VAS stress scores: $F(6.45, 496.84) = 5.61$, $p < 0.001$. Tests of within-subjects contrast showed that VAS stress scores were significantly higher for October ($M = 43.32$, $SD = 23.36$) and November ($M = 48.20$, $SD = 24.05$) and significantly lower for February ($M = 35.20$, $SD = 23.09$) and March ($M = 36.41$, $SD = 23.39$) when compared to the overall mean.

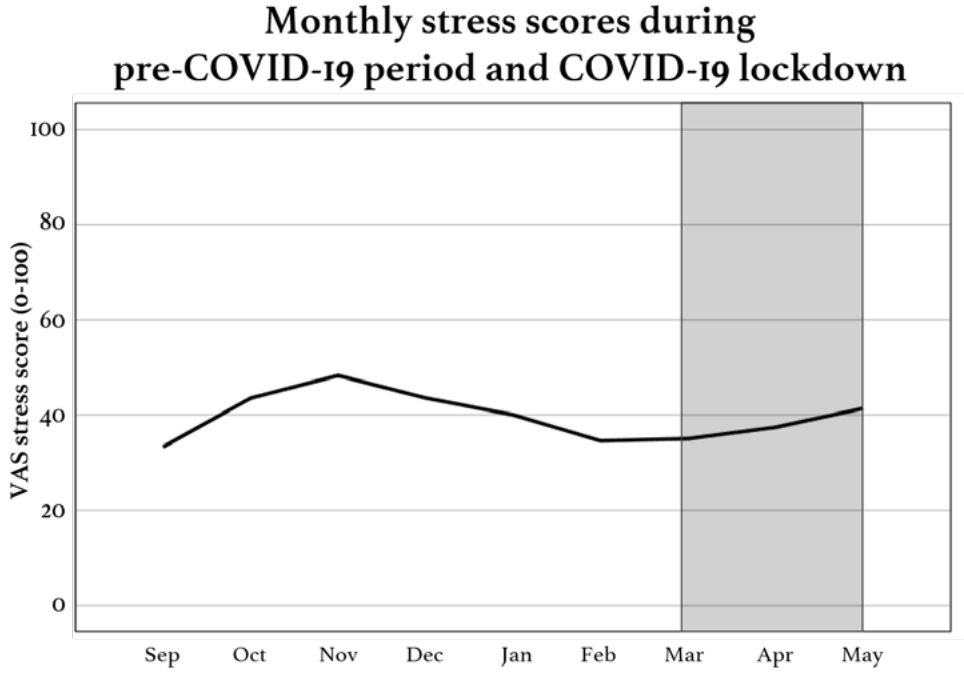


Figure 7.1. Monthly stress scores (VAS scale ranging from 0 to 100) during the pre-COVID-19 period (Sep – Feb) and during the COVID-19 lockdown (Mar – May: grey area).

Sleep Quality

Figure 7.2 shows the sleep quality scores on a ten-point scale. The average sleep quality score was 6.58 throughout the academic year. The average score was highest in April and lowest in November. The average sleep quality score was 6.44 during the pre-COVID-19 period and 6.87 during the COVID-19 lockdown. The assumption of sphericity was violated by Mauchly's Test of Sphericity [$\neg\chi 2(35) = 102.482$, $p < 0.001$]. Therefore, the Greenhouse-Geisser correction was used. There was a significant effect of time on sleep quality scores: $F(6.01, 432.92) = 3.83$, $p < 0.001$. Tests of within-subjects contrast showed that sleep quality scores were significantly lower in November (M = 6.12, SD = 1.76) and January (M = 6.33, SD = 1.39) and significantly higher for April (M = 6.90, SD = 1.54) and May (M = 6.89, SD = 1.56) when compared to the overall mean.

Additional Mental Health Items During COVID-19 Lockdown: Subjective Mental Health, Mental Health Inventory, and Loneliness

Subjective mental health rating scores were 3.07 ± 0.87 in March, 3.16 ± 0.98 in April, and 3.24 ± 0.89 in May. The results showed that 27.6% of the participants were mentally unhealthy in March, 32.7% in April, and 35.7% in May. At least 75.5% of the participants dealt with moderate to very severe loneliness in all 3 months.

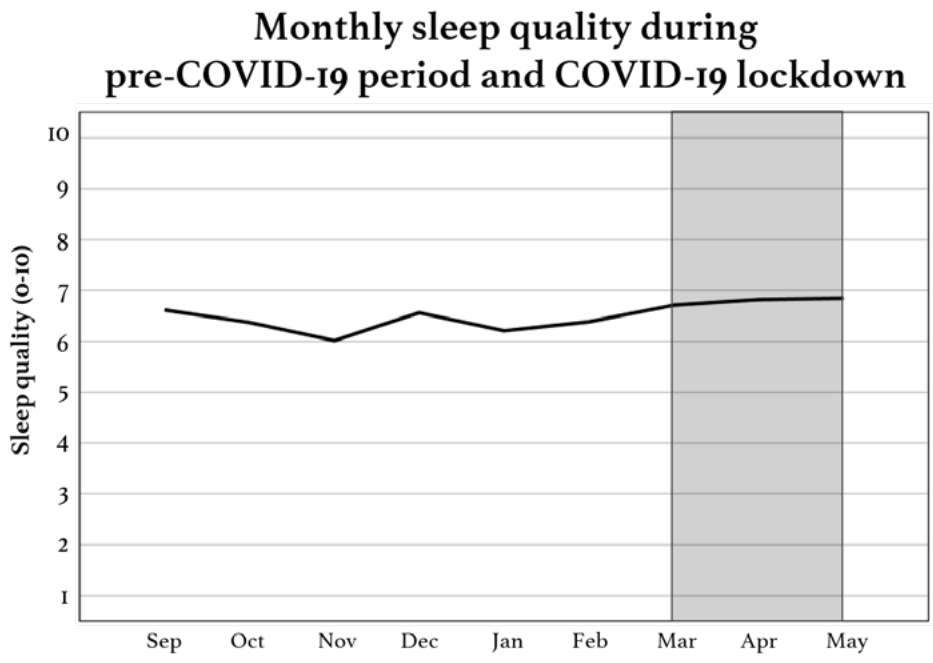


Figure 7.2. Monthly sleep quality scores (ranging from 1 to 10) during the pre-COVID-19 period (Sep – Feb) and during the COVID-19 lockdown (Mar – May: grey area).

Discussion

In this study, we investigated the change in mental health, stress levels, and sleep quality of performing arts students during the COVID-19 pandemic. We compared the prevalence of mental health complaints, stress levels, and sleep quality during COVID-19 lockdown with the prevalence, stress and sleep scores in the 6 months prior to the lockdown. This within-person comparison showed that the prevalence of mental health complaints of performing arts students was negatively affected by the strict collective prevention measures taken by the Dutch government.

Our results are in agreement with results from a study including undergraduate students (Elmer et al., 2020). This Swiss study showed that undergraduate students became more depressed and slightly more anxious during the COVID-19 outbreak. Factors associated with this decline in mental health included living alone, as well as receiving less contact and support from one's personal network. Earlier empirical research has also highlighted the importance of social networks for health and well-being (Elmer et al., 2017; Kawachi & Berkman, 2001). The absence of social support might play an important role in explaining the increase in performing arts students' mental health complaints. The majority of these students come from abroad and are living on their own for the first time, away from family and friends. Due to the lockdown restriction, these students were isolated from their social support network, and some of them were forced to live in self-isolation for the majority of the day during a three-month period. This is challenging, and our study showed that at least three-quarters of participants dealt with moderate to very severe loneliness during this period. Furthermore, it is suggested that performing artists are more strongly affected than the population at large by the special conditioning of the COVID-19 pandemic, because they view performing as a basic necessity. Accordingly, being deprived of this is stressful to them (Primov-Fever et al., 2020).

Our study did not find a significant negative association between stress levels, sleep quality and the restrictions during the COVID-19 lockdown. This might be explained by the fact that students perceived both positive and negative changes due to the situation. This is in agreement with a previous study showing that some students reported that the crisis situation affected their lives positively regarding a reduced fear of missing out and sense of competition among students (Elmer et al., 2020).

Strengths and Limitations of the Study

To our knowledge, this is the first study to investigate the effects of COVID-19 regulations on the mental health of performing arts students. Although the sample size of our study is relatively small, the response rate is rather high, and the presented data is accurately measured. Therefore, we believe that the results are representative for this specific target population. A major strength of our study is the use of a prospective design with monthly follow-ups. This design enabled us to assess the association between an exposure (i.e., COVID-19 regulations) and an outcome (i.e., mental health).

Besides these strengths, our study has several limitations. First, we used student-reported outcomes to assess mental health problems, which produced subjective data. We recommend the inclusion of a follow-up from the medical staff (e.g., clinical psychologist) during the data collection period in future studies to assess detailed diagnostic information regarding the registered mental health problems (i.e., diagnose, severity, comorbidity). Second, students were only able to register their most severe health problem, whereas research has shown that mental health problems often co-exist with physical problems (Adam et al., 2004; Mainwaring & Finney, 2017).

Therefore, it might be difficult for students to address them separately, which may have resulted in under-estimating the prevalence of all mental health problems. However, we used this arbitrary method both before and during the COVID-19 lockdown, and therefore our significant increase in mental health problems cannot be explained by this data collection method. Under-estimation of mental health problems can also be caused by the heightened stigma around mental health. The fear of being excluded due to mental health problems has been illustrated in athletic (Bauman, 2016) and dance populations (Karreman et al., 2019). Due to these reasons, the prevalence of mental health complaints in our sample cannot be compared with the prevalence found in other target populations. Finally, to assess the most severe mental health complaint, the OSTRC questionnaire on health problems was used (Clarsen et al., 2014). This questionnaire was validated in elite athletes but a comprehensive assessment of the psychometric properties of the OSTRC questionnaire within performing artists is lacking. Kenny et al. (2018) found a moderate agreement between third-party and self-reported injury registration, using the OSTRC questionnaire, in a population of pre-professional dancers (Kenny et al., 2018). Despite the fact that this questionnaire is regularly used in a population of performing artists (Kenny et al., 2018; Stubbe et al., 2018; van Winden et al., 2019, 2020a) future investigations assessing the psychometric properties of the OSTRC questionnaire in such a population are needed.

Conclusion

The prevalence of mental health problems in performing arts students significantly increased during the COVID-19 lockdown, during which a total of 27.6% students sustained a health problem. At least 75% of the participants dealt with moderate to very severe loneliness in all 3 months during the COVID-19 lockdown.

At the time of writing, the COVID-19 crisis is still unfolding, and more research is needed to grasp the effects of COVID-19 on health issues in performing artists in the long term. We hope that our results encourage replications of the study in different countries, subgroups of performing arts (music, dance, and circus), and skill levels (amateur, pre-professional, and profession level), which will increase collective knowledge about successful interventions to enhance performing artists' mental health during the COVID-19 pandemic and beyond.

Chapter 8. General Discussion

General Discussion

"Dancing per se will not get you injured, but the pressure of the environment."

pre-professional contemporary dancer

General Discussion

The primary aim of this thesis was to develop knowledge on health problems in contemporary dance students. Three specific aims were formulated: first, to examine the incidence of mental and physical (i.e., injuries) health problems; second, to gain insight into the mental risk factors regarding injuries; and third, to develop further knowledge on the psychosocial responses of contemporary dance students during injury rehabilitation.

Knowledge about mental and physical health problems is essential to the pre-professional dance environment (i.e., dance students, dance schools, teachers, directors and health care professionals). As dance training is physically and mentally demanding, dance students are at a high risk of sustaining health problems. Moreover, these health problems can be highly disadvantageous for their personal and professional development. Gaining these insights enables us to develop preventive measures, and can better equip health professionals and dance teachers in helping dance students navigate the injury-recovery process and deal with their mental and physical health. However, within the dance literature, there is a lack of high-quality studies concerning the prevalence and risk factors of injuries, mental health problems and psychosocial responses during injury rehabilitation. This highlights the importance of this thesis.

This chapter presents a discussion of the main findings, addresses the core methodological considerations, and describes the implications for future research and practice. Finally, the chapter ends with providing an overall conclusion to the thesis.

Main findings

Injury incidence

This thesis illustrates high health problem incidence proportions (IP). Overall, 97% of the students reported at least one physical/mental health problem during one academic year.

The findings from ***Chapter 2*** indicated a 'high' one-year injury IP of 81%, of which 58% were substantially injured (i.e., leading to moderate or severe reductions in training volume or moderate, severe, or complete reductions in performance) (Clarsen et al., 2014). These results are in line with previous literature with one-year IP ranging from 37 – 86% (Kenny et al., 2016, 2018; Lee et al., 2017). In agreement with previous studies (for instance, Lee et al., 2017; Shah et al., 2012), the most common injuries involved the ankle/foot (30%), lower back (15%) and knee (14%).

Incidence of mental health problems

The findings from ***Chapter 3*** indicated a 'moderate to high' one-year IP for all reported mental health problems of 45%. Furthermore, 29% of the students reported a mental health problem as their most severe health problem over a physical injury or other health problem. Of these students, 39% indicated a substantial mental health problem. These results were much lower than the reported prevalence of 92% by Laws and Apps (2005) among contemporary dance students. These differences are most likely the result of different designs (i.e., prospective versus retrospective) and method of questioning. The most reported types of mental health problems were general anxiety (20%), stress due to external factors (18%), and constant tiredness (17%). This outcome differed as well from the results of Laws and Apps (2005), possibly due to differences in study population.

In ***Chapter 7***, we analysed the effect of the strict lockdown prevention measures taken by the Dutch government due to the global pandemic of the coronavirus disease (COVID-19). Overall, the prevalence of mental health problems of all performing arts students (i.e., Bachelors in Dance, Dance Teacher, Circus Arts, and Music Theatre) was negatively affected by the COVID-19 pandemic lockdown restrictions. These results are in line with previous research among undergraduate students (Elmer et al., 2020). During the lockdown, performing arts students perceived less stress and their sleep quality increased. However, the 3-month prevalence of mental health problems was significantly higher during the COVID-19 lockdown compared to two pre-COVID-19 periods. Furthermore, three out of four students dealt with moderate to very severe loneliness in all three months of lockdown.

Injury risk factors

Multiple mental risk factors of dance injuries have been investigated in ***Chapter 4***. From the included mental risk factors, only limited coping skills was found to be associated with an increased risk of sustaining a substantial injury. Moreover, baseline characteristics that were included based on previous literature, namely age and BMI, also showed significant associations with injury risk. In total, the multivariate model explained 24% of the variance in the substantial injury group.

More specifically, with every point higher on the total coping score (range 0 – 84), students are 9% less likely to sustain an injury. Previous literature within sports and dance (e.g., Ivarsson et al., 2017; Noh et al., 2005, 2007) has shown a relationship between coping and injury risk as well. Moreover, with each year older, students are 33% less likely to sustain an injury (M = 19.2, range: 16 – 25). Younger students may have a greater injury risk due to the adolescent growth spurt leading to decreased physical strength, for instance (Bowerman et al., 2014; Caine et al., 2008).

Dance students are still in a period of maturation and development (Bowerman et al., 2014; Lee et al., 2017), and are not yet physically mature. As dancers age and gain experience, they are likely to become more aware of the warning signs of injuries and take preventive steps (H. Thomas & Tarr, 2009). In agreement with our results, Bronner and colleagues (2003) suggested that young dancers might need assistance in managing the stress they experience throughout their (academic) career. Furthermore, with every point higher on BMI, students are 38% more likely to sustain an injury, possibly due to greater force that needs to be absorbed through soft tissue and joints (Richmond et al., 2013).

No significant results were found for perfectionism and self-regulation as potential risk factors. It is possible that the direct link between perfectionism and self-regulation with injury is not visible due to an indirect, moderating effect of both aspects on the relationship between stress and injury. To illustrate, dancers with perfectionistic tendencies show greater anxiety and lower self-confidence (Nordin-Bates et al., 2011), which can influence the stress response and, as a result, the probability of injury occurrence (Williams & Andersen, 1998). Self-regulation can also predict levels of well-being, mental health functioning, and stress in students (Gagnon et al., 2016; Park et al., 2012), and, thus, the likelihood of injury occurrence. Moreover, a conflict between protecting one's health and pushing one's limits in order to reach peak performance has been shown in sports, especially during adolescence (van der Sluis et al., 2017, 2019). Besides this, a culture of dancing through pain and injuries is well known and still present (Grove et al., 2013; Higginbotham & Cahalan, 2020; Mainwaring et al., 2001), making it even more difficult to self-regulate and take the right decisions regarding your health, as shown in ***Chapter 6.***

In ***Chapter 5***, an association between general stress levels and injuries was indicated, in line with previous dance research (Adam et al., 2004; Krasnow et al., 1999; Noh et al., 2005) and the stress-and-injury model (Williams & Andersen, 1998) (Figure 1.2). An overall average monthly general stress score of 39.8 (range 0 – 100) was shown. No dance-specific literature was available, therefore, we compared our results with work-related literature. Our average score could indicate a moderate stress level as scores below 30 classify as low stress and above 60 as high stress (Ritvanen et al., 2006). Overall, injured students reported higher stress scores than injury-free students, although not all of the monthly stress scores were significantly higher for injured students. Furthermore, within the 3-month period before and during injury occurrence, a significant linear effect of increasing stress scores from the injury-free to the injury period was found.

Psychosocial responses during injury rehabilitation

In ***Chapter 6***, we examined the psychosocial responses of contemporary dance students during the injury rehabilitation process using semi-structured interviews. Results showed that cognitive appraisals of the demanding and performance-focused culture of dance resulted in highly perceived pressure and negative emotions. Moreover, being part of a school system with a limited timeframe to achieve their goals increased this pressure. Generally, students showed constructive coping behaviour strategies to (mentally) feel better. However, they also revealed non-constructive strategies to continue dancing as a result of the previously mentioned pressure, with possible long-term consequences. Alongside this, time pressure and uncertainty about their injury course also negatively impacted their emotional responses, coping strategies and ability to listen to their body's needs, which is in agreement with the sports literature (Gallagher & Gardner, 2007; Wadey et al., 2013). Furthermore, injury management, induced by feedback from others or insufficient recovery trajectories, indicated how students adjusted their coping behaviours based on injury consequences. Eventually, students learned the importance of (body) awareness, having a positive mindset, social support and focusing on their future health.

Overall, the main results showed that coping behaviours were often influenced by the beliefs students have around the 'hard' culture of dance. This is in agreement with the 'integrated model of response to sport injury' (Wiese-Bjornstal et al., 1998), which states that cognitive and emotional factors can influence injury-related (coping) behaviours. In line with previous research, our results show that the sociocultural context has important implications for the psychological responses to injuries (Bolling et al., 2019; Wiese-Bjornstal et al., 1998).

The 'hard' culture within dance is still present, in which injured dancers continue to dance, hide their injury or hasten their return because they perceive that 'others' expect this, with possible long-term health consequences (Higginbotham & Cahalan, 2020; Mainwaring et al., 2001).

Limitations and future research

Methodological considerations

Methodological strengths and limitations are discussed in detail in each chapter. Notably, a number of methodological factors strengthened or limited the various study's internal validity, reliability and generalisability, and should therefore be considered when interpreting the overall results of this thesis.

Study design

This thesis consists of quantitative methods, using a longitudinal prospective cohort study, including multiple cohorts ***(Chapters 2 to 5 and 7)*** and a qualitative method ***(Chapter 6)***. The applied methodological strategies strengthened the quantitative studies. First, prospective cohort studies are considered to be a high-quality, epidemiological study approach (Bahr & Holme, 2003). Second, multiple statistical methods were used: in ***Chapter 4***, we used univariate and multivariate logistic regression techniques to investigate associations between potential risk factors and the first consecutive injury during follow-up, in correspondence with standard methodology for sports injury research (Bahr & Holme, 2003). Furthermore, ***Chapter 5*** uses statistical methods at the between-subject level (injured versus injury-free students), as well as at the within-subject level (injury-free, pre-injury, and injury periods), just as in ***Chapter 7*** (pre- and during COVID-19 lockdown). Third, multiple cohorts of first-, second- and third-year contemporary dance students were investigated, with large sample sizes compared to other studies within dance.

However, there are limitations concerning the study design and methodologies as well. For instance, the power of the logistic regression analyses in ***Chapter 4*** is rather small due to the used sample size, resulting in overfitting of the final model (i.e., not meeting the rule of thumb of at least 10 cases per factor). This urges us to be careful in drawing (firm) conclusions. Furthermore, in ***Chapter 5***, overall monthly stress scores were measured, which could result in missing out on sudden changes and short periods of high stress due to the day-to-day variability of stress (van der Does et al., 2017).

The use of a qualitative method strengthened the thesis' overall methodology. The applied approach strengthened the specific qualitative study ***(Chapter 6)***. By incorporating a qualitative study design with an epistemological constructionism approach, we were able to comprehend the injury experience from the dancer's personal perspective (B. Smith & McGannon, 2018). We conducted semi-structured interviews using purposive sampling (J. Green & Thorogood, 2018) and thematic analysis (Braun & Clarke, 2008). The trustworthiness of the data was established by peer review, participant checking, and reaching a triangulated consensus amongst the researchers.

Used definitions, questionnaires and bias

Previous studies within dance have shown that self-reported injuries may generate a better estimation of the number of injuries compared to medical attention or time loss injuries (Baker et al., 2010; Kenny et al., 2018).

Therefore, major strengths of this thesis are the incorporated surveillance method of Clarsen and colleagues (2013, 2014) focusing on the consequences of health problems, and our broad injury definition (i.e., "any physical complaint sustained by a dancer leading to consequences on participation, training volume, and/or performance, irrespective of the need for medical attention or time-loss from dance activities").

However, information bias may have influenced the results presented in ***Chapters 2 to 5 and 7***, due to several factors: first, data regarding health problems were collected using student report methods. As most students lack medical expertise, we were unable to record specific diagnoses of the reported injuries or mental health problems. Yet, we used a clear injury definition and a previously developed list of mental health issues (Laws & Apps, 2005; van Rossum, 2008). Furthermore, our well-structured injury surveillance system (PAHM) uses relatively short recall periods to decrease recall bias.

Second, to assess the most severe health problems, the Oslo Sports Trauma Research Center (OSTRC) Questionnaire on Health Problems (Clarsen et al., 2014) was used. This questionnaire was validated in elite athletes and is regularly used within the performing arts (Kenny et al., 2018; Stubbe et al., 2018; van Rijn & Stubbe, 2020, 2021; van Seters et al., 2020). Kenny and colleagues (2018) found moderate agreement between third-party and self-reported injury registrations using the OSTRC questionnaire among pre-professional dancers. However, a comprehensive assessment of the psychometric properties of the OSTRC questionnaire within performing artists is still lacking. Furthermore, the used coping questionnaire ***(Chapter 4)*** was adjusted from sports to dance, however, the psychometric properties were not re-evaluated.

Furthermore, the used self-regulation questionnaire in ***Chapter 4*** is not dance-specific, as self-regulation is considered a domain general concept (i.e., a concept that is stable within a certain domain such as sports/dance/study) (van der Sluis et al., 2019). However, this might have influenced the results concerning self-regulation as a dance injury risk factor.

Third, it is important to be aware of the possibility of social desirability bias in questionnaires on psychological constructs (Neal & Carey, 2005), due to the heightened stigma around mental health. The fear of being excluded as a result of physical and mental illness has been illustrated in dance populations (Karreman et al., 2019; Kenny et al., 2018), and can result in lower self-reported incidence and/or severity of health problems. In order to reduce the potential of social desirability, results from questionnaires and interviews were anonymously analysed and not shared at an individual level with the students' teachers across all of the studies.

Finally, in ***Chapter 6***, some of the participants were not native English or Dutch speakers and may not have been able to express their ideas as easily in these languages, even though the educational programmes had either English or Dutch as the main language. This might have also influenced the results from the quantitative studies ***(Chapter 2 to 5 and 7)***.

External validity

Although this thesis provided valuable insight into the health problems within contemporary dance students, a number of factors limited external validity. Caution is warranted when generalising the findings to other populations due to the specific characteristics of the contemporary dance student population. Contemporary dance students have specific backgrounds in terms of sports/dance activities (e.g., dance history, pre-education, and dance level), and physical exposure (i.e., classes, rehearsals and performances). Moreover, while the demands and training required for dancers are just as demanding as for professional athletes (Bird, 2009), dance differs from the majority of sports due to its artistic expression (Toledo et al., 2004). Furthermore, dance students perform within a school system with a limited time-frame for achieving their artistic and academic goals (Weigert, 2005). Additionally, the results of ***Chapter 5*** only apply to first-year students, as only first-years were included within this study to investigate their specific curriculum in-depth. These results may help direct injury prevention in second-year students in light of the similarity across their curriculums. However, generalisability to third-year (and fourth-year) dance students is limited, as these curriculums differ to a larger extent. ***Chapter 6*** includes students from another European contemporary dance institute to gain more insight into contemporary dance culture in general.

This multi-institute approach improved the external validity with other contemporary dance institutes concerning the psychosocial responses towards injuries, as no significant differences were found.

In general, the particularities of the educational programme and the contemporary dance student population limits generalising the results to other professional or amateur dance contexts and genres (e.g., classical ballet, hip-hop or jazz), as well as to general student and other sporting contexts. However, the results may help to inform the development of preventive measures in other contemporary dance educational programmes with similar dance exposure, due to the similarities in physical and mental demands of dance classes. However, possible differences in dance styles and classes have to be kept in mind. Contemporary dance consists of multiple styles (R. Martin, 2013), whereby the specific techniques used within pre-professional contemporary dance training can (slightly) differ across the world.

Implications for future research

This thesis developed knowledge on injuries and mental health problems in contemporary dance students. However, future research is needed as much is still unknown. Specific recommendations for future research are provided within the previous chapters. General challenges and opportunities for future research are stated below.

First, ***Chapter 2 to 5 and 7*** described health problems through the use of subjective measures. It is recommended to include more objective measurements, such as follow-ups from medical staff (e.g., physiotherapist or clinical psychologist) to assess detailed diagnostic information regarding the registered health problems (i.e., diagnosis, aetiology, severity, comorbidity). This supports a more comprehensive analysis of health problems and can better guide preventive measures. In order to develop prevention programmes for specific types of injuries, correct diagnosis and aetiology are important for recognising adequate risk factors. More specifically, there might be different mental risk factors for acute versus overuse injuries as mentioned in the sports literature (Pensgaard et al., 2018). Furthermore, we recommend measurement of objective stress levels to supplement the subjective data, using physical parameters such as cortisol or amylase (Takai et al., 2004). Self-reported perceptions may be influenced by dancers' interpretations and beliefs, which, in turn, might be predisposed by the 'hard' culture in dance, potentially causing lower subjective stress levels.

Second, more research with larger sample sizes is needed, especially to gain insight into the mental risk factors for physical and mental health problems. In ***Chapter 4***, only 24% of the variance in the substantial injury group was explained by the used model. This indicates that the vast majority of substantial injuries in this contemporary dance student population was not explained by the model. Besides, in ***Chapter 5*** small to medium effect sizes were found. Therefore, future research within dance should investigate other mental and physical risk factors as well. For instance, some studies have shown that dance exposure (i.e., years of training, exposure hours), poor aerobic capacity (Kenny et al., 2016) or a history of mental health problems (Yau et al., 2017) could be associated with injury risk. In addition, studies on sports have indicated mental detachment (Balk et al., 2019), perceived recovery (van der Does et al., 2017), sleep volume (von Rosen et al., 2017b, 2017a) and self-esteem (von Rosen et al., 2017a) as potential injury risk factors. It is important to include stress as a potential influential factor in further research, as there are indications that the influence of coping, perfectionism and self-regulation on injuries could (partly) be modulated by the effects of stress on sustaining an injury (Ivarsson et al., 2017) ***(Chapter 4)***.

Furthermore, the sports literature has suggested that physical health status (i.e., being injured) or experiencing performance difficulty could influence the risk of sustaining mental health problems (Rice et al., 2016). Therefore, it is important to combine physical and mental health problems in research to gain a comprehensive understanding of dancers' overall health.

Third, although our one-year prospective cohort study is unique in its high response rate and the subsequent monthly follow-ups, we recommend the inclusion of longer follow-up periods (i.e., full education period per student). These are needed to gain more insights into the differences among study years (first-, second and third-year) and educational programmes (Bachelor Dance and Bachelor Dance Teacher). These insights can guide the optimisation of training load and, thereby, decrease potential stressors (e.g., specific periods/classes or dealing with specific expectations). A higher measurement frequency is recommended in future research, specifically for stress levels due to day-to-day variability (van der Does et al., 2017; von Rosen et al., 2017a). For instance, weekly monitoring can help to intervene more quickly to prevent health problems from developing or worsening. Furthermore, exploring the effects of varying stress levels on injury risk at the within-subject level can provide important insights into the association between stress and injuries. The use of more sophisticated statistical models, such as joint models (Long & Mills, 2018), is interesting for future dance injury research.

To illustrate, results from ***Chapter 4*** (e.g., more 'stable' risk factors such as age and BMI) and ***Chapter 5*** (i.e., stress levels) could be combined, as survival and longitudinal sub-models can be linked and individual predictions can be included (Long & Mills, 2018). Moreover, exposure to risk factors for injuries can be frequent and variable (Meeuwisse et al., 2007). As such, potential risk factors, such as coping in ***Chapter 4***, should be collected at regular intervals, similar to the outcome variable.

Finally, it is recommended to work towards developing and teaching effective coping skills for contemporary dance students in order to teach students to better cope with stress and their beliefs surrounding dance. Furthermore, as not all injuries can be prevented, coping skills might enable students to intervene early when they do experience injury. Interventions targeting change within the dance culture are important to reduce the perceived pressure on students. For instance, investigating appropriate forms of social support for injured dancers, as well as examining the effect of education as to the mental aspects of dance and dance injuries (e.g., pain appraisal, body awareness, the influence of their thoughts and emotions on their behaviours) is needed.

Practical implications

The thesis' results have a number of implications for the practice of dance, especially concerning dancers' health problems. It should be noted that the recommendations do not aim to provide a one-size-fits-all approach. More than that, they are guidelines for further development of preventive strategies to eventually lower the number of health problems, and better handle them when they do occur. As contemporary dance students are at a high risk of sustaining physical (i.e., injuries) and mental health problems, it is of the upmost importance that contemporary dance schools pay attention to the mental and physical health of their students and try to prevent issues from arising. However, identifying and treating health problems in dancers is a complex task, particularly due to the dancers' beliefs about the 'demanding and performance-focused culture of pain tolerance and injury suppression' (i.e., dance world's mentality about injury and pain).

Concerning their mental health, students mainly reported general anxiety, stress due to external factors and constant tiredness. These complaints are in agreement with specific stressors in dance, such as high expectations from others, competitive auditions and a demanding training schedule (Adam et al., 2004; Krasnow et al., 1999). Moreover, during injury rehabilitation, contemporary dance students perceived high pressures and negative emotions.

These results show the importance of balancing the psychological demands with strategies to support mental health for contemporary dance students in general (Balk et al., 2018) and especially during injury rehabilitation, for instance by lowering expectations and taking enough time away from dance.

Furthermore, although the literature on dance medicine and science has traditionally focused on physical risk factors of injuries, our results indicate that psychological variables are associated with the occurrence of dance injuries as well. This finding is in agreement with recent reviews within dance (Mainwaring & Finney, 2017; Pollitt & Hutt, 2021). Overall, mental health should be further incorporated within injury improving strategies, promoting a holistic approach (Pollitt & Hutt, 2021), with room to differentiate at an individual level. In general, our results indicate that two factors are important when looking at injury prevention. Low coping skills (i.e., the way students handle stress and problems) are an injury risk factor. Combined with elevated stress levels regarding injury occurrence, this shows that increasing coping skills and lowering stress levels could be useful in injury prevention interventions.

Injury prevention

Stress and coping skills

Stress occurs when the environmental demands exceed the abilities of the individual to cope with the demands of specific events or experiences (e.g., stressors) (Lazarus & Folkman, 1984). Within our sample, we looked at general psychological coping resources in relation to injury risk. More specifically, coping with adversity, coachability, concentration, having confidence, achievement motivation, goal setting and mental preparation, peaking under pressure, and freedom from worry were included (R. E. Smith et al., 1995). Overall, these skills indicate active coping styles (i.e., actively dealing with stress and problems), which may protect dancers from sustaining injuries by buffering the effects of stress. These skills can help to perceive fewer situations as stressful/problematic, as a stressful situation can cause greater injury risk due to muscle tension and lack of focus (Williams & Andersen, 1998).

Interventions resulting in decreased injury risk are, for instance, psychological skills training, cognitive behavioural therapy and mindfulness. They are most likely effective due to the down-regulation of stress-related brain activations that interfere with functioning at different levels (e.g., attention, decision-making, worrying cognitions and physiological reactions) (Ivarsson et al., 2015, 2017; Williams & Andersen, 1998).

The stress-and-injury model (Williams & Andersen, 1998) explicitly states that interventions aimed at physiology (e.g., relaxation) and attention (e.g., mindfulness) should be beneficial in reducing the stress response and injury risk (Ivarsson et al., 2015, 2017). Furthermore, imagery, self-talk and relaxation techniques enhanced coping skills (i.e., peaking under pressure, coping with adversity, having confidence and achievement motivation, and concentration) and reduced injury frequency among young ballet dancers with low-coping skills, compared to control groups (Noh et al., 2007). Our results combined with previous research provide insight into the direction of (new) injury preventive strategies. It is important to focus on enhancing students' available coping resources through teaching and demonstrating skills, for instance, by using focus techniques such as goal setting (Pollitt & Hutt, 2021), and relaxation techniques such as mindfulness (Ivarsson et al., 2015, 2017).

Overall, mindfulness- and acceptance-based behavioural interventions used to enhance performance and well-being have become more popular in sport psychology and have gained more support in basic and applied research over the past 20 years (Gardner & Moore, 2017; Shortway et al., 2018).

Mindfulness can be an effective instrument to achieve a relaxed state of body and mind (Arvinen-Barrow & Walker, 2013), and potentially reduce stress and the subsequent physiological (e.g., relaxation) and attentional (e.g., mindfulness) changes (Ivarsson et al., 2017). A recent study among university dance students indicated that improvements in mindfulness may help students with numerous general and dance-specific demands (Blevins et al., 2021).

One of the new, promising approaches within psychology beyond mindfulness is the evidence-based treatment Acceptance and Commitment Therapy (ACT) (Hayes, 2004). Within sports, the Mindfulness-Acceptance-Commitment (MAC) intervention is the first and empirically researched example based on the principles of ACT. MAC has shown to increase overall psychological and general well-being of (sport) performers (Gardner & Moore, 2007) and appears to be an effective intervention compared to more traditional psychological skills training (PST) (Gross et al., 2018). ACT principles might be more effective as people can engage in meaningful behaviour and experience physical issues or difficult emotions (Kangas & McDonald, 2011; Shortway et al., 2018). In addition, research supports using mindfulness- and acceptance-based processes and psychological flexibility as mechanisms of behavioural change for people with chronic pain, including adolescents (Dahl et al., 2004; Day et al., 2014; McCracken & Gutiérrez-Martínez, 2011; Wetherell et al., 2011; Wicksell et al., 2005). When combining these promising results from the literature with our results, we could see a great overlap between the broad-based coping skills we included in our research and the framework of ACT.

For more detailed information on this topic, see Appendix 'Towards a new intervention'. Overall, working with ACT towards more psychological flexibility could possibly lead to an increase in active coping skills, and therefore, reduce injury risk. However, there is not yet sufficient research within injury rehabilitation and, to our knowledge, no research at all within the dance context.

Workload

The management of workload and training environment could also aid in protecting dancers' physical and mental health (Grove et al., 2013; Rice et al., 2016) and reducing stress levels. To illustrate, monthly stress levels peaked during important periods, such as exams and special project weeks. Furthermore, dancers typically face an increase in demands prior to important performances, which is in contrast to sports, where tapering periods are common before an important match (Balk et al., 2018).

Lowering workload during stressful periods, as well as facilitating possibilities for dancers to leave their dance bubble for 'mental detachment' (Balk et al., 2018) might help balance stress levels, and thereby influence the injury burden. For instance, by taking time off after stressful periods, spreading exams over longer periods of time, organising non-dance activities and facilitating support systems. Furthermore, at the start of the school year, it is important to use periodisation strategies to optimise the build-up of the dance workload on an individual basis, such as lowering the number of jumps in classes. Overall, dance teachers and schools should be better equipped with handling the health problems of their dance students. They need sufficient knowledge about injury risks and causes, including how to build up the dance workload.

The influence of dance culture

The 'demanding and performance-focused culture of pain tolerance and injury suppression' was well established in the dance literature almost 20 years ago (Mainwaring et al., 2001), and is still present according to our results. This culture makes it difficult for dance students (and dancers) to make the right decisions regarding their health. As illustrated by Rivera and colleagues: "perceptions about how dancers are expected to work through pain play a significant role in whether they will choose to rehabilitate." (Rivera et al., 2012, p. 12). For adolescents, short-term success seems more attractive despite the possible long-term consequences, due to developmental cognitive processes, which, in turn, seems to be related to sports injuries (van der Sluis et al., 2017). This was also shown within our study sample. Furthermore, dancing through pain not only results in ignoring the current complaint, but it can also change pain perception.

This change in perception makes dancers more prone to experiencing pain to compromise motor output (i.e., protect the body) when there is no viable threat to the body (Wallwork et al., 2017). As a result, injury risk may increase. This shows that a culture shift within dance towards accepting pain and injury as part of life and as important warning signals is important.

Our results concerning coping with injuries during rehabilitation ***(Chapter 6)*** indicated that the subjective interpretation of the 'hard' culture and the school system plays an important role in the perceived pressure of students. This, in turn, negatively influences the way they handled their injury by evoking strategies to continue dancing while being substantially injured. If we combine these results with the results focusing on injury risk ***(Chapter 4 and 5)***, it could be expected that the perceived pressure results in elevated stress levels during injury recovery, but also in daily life.

These elevated stress levels are associated with injuries, and could indicate a lack of coping skills, which is, again, an injury risk, showing the vicious cycle of coping, stress and injuries. Therefore, reducing the number of injuries (prevention) and better handling injuries when they do occur (coping) to improve injury rehabilitation go hand-in-hand.

Improving injury rehabilitation

Students often have insufficient knowledge to manage injuries by themselves (Mainwaring et al., 2001). Therefore, teaching contemporary dance students more about pain appraisal, body awareness, the influence of their thoughts and emotions on their behaviours and the importance of reinforcing their own boundaries is important. Educational interventions on the relationships between pain and normal (sport) participation, with transparent communication about injury risks and causes could lead to increased body awareness (von Rosen et al., 2018). In addition, somatic techniques, such as Pilates, the Alexander Technique or the Feldenkrais method, could further improve body awareness (Tarr & Thomas, 2011), which could help students adjust their behaviour during recovery. Moreover, teaching students about the negative effects of stress and a lack of coping skills when dealing with injuries (Jacobs et al., 2012) can help them to balance the short-term benefits and long-term consequences of continuing to dance when stressed, tired or in pain.

Furthermore, positive support from the environment is essential as students often felt that 'others' expected them to continue dancing despite their pain and injury. For instance, actively listening to the dance student, asking questions about their thoughts and feelings, validating their emotional and cognitive confusion, and reassuring them that taking time to recover is appropriate could all aid in comforting the student.

According to self-determination theory, relatedness, autonomy, and competence are the basic needs for motivation (Ryan & Deci, 2000), and were shown to be important during injury rehabilitation (Podlog & Eklund, 2007, 2010). In agreement with these basic needs, Mainwaring and colleagues (2003) outlined practical strategies for helping young dancers cope with injury, which included modifying dance activities, providing alternative activities during dance training, and making constructive use of their time outside of the studio. Being engaged in dance activities could result in feeling related to their classmates, competent about the aspects that are being achieved and autonomous by being able to decide what to do within the recovery process, for instance by being in class or rehabilitating elsewhere, providing space for individual preferences and differences.

Furthermore, Mainwaring and colleagues (2003) propose multiple psychological strategies to facilitate psychological recovery, such as social support, acquiring information about injury rehabilitation, positive self-talk, goal setting, and journaling, as well as counselling sessions for relief, coping, and pain management. Individual counselling, in particular, could be useful. To illustrate, 60% of dancers (professional, student and amateur) seeking injury treatment met the requirements for referral to a psychologist (Air, 2013).

Finally, Mainwaring and colleagues (2003) pointed out the use of visualisation and relaxation techniques, which are helpful in reducing stress levels, lowering injury risk and improving rehabilitation, illustrated by Noh and colleagues (2007). Mindfulness can help to achieve a relaxed state of mind and body and allow an individual to gain more awareness and acceptance about their situation as an injured athlete (Arvinen-Barrow & Walker, 2013). The study of Moesch and colleagues (2020) provided limited evidence that implementing a mindfulness- and acceptance-based approach can be beneficial for injured athletes' mental health. The results indicated statistically and clinically significant increases in nonreactivity (i.e., a subscale of mindfulness) and well-being, as well as clinically significant increased levels of acceptance. In addition, Mohammed and colleagues (2018) indicated that a Mindfulness Based Stress Reduction (MBSR) treatment during sports injury rehabilitation resulted in an increase in pain tolerance and mindful awareness. Furthermore, Acceptance and Commitment Therapy (ACT) shows promising results by reducing rumination (i.e., continuously thinking about the same thoughts) in professional adolescent female athletes with injuries (Hamidi et al., 2020). For more information on mindfulness- and acceptance-based interventions, see Appendix 'Towards a new intervention'.

Intervening at multiple levels

In order to address the complexity of health problems, it is important to not only include the individual level, but also the socio-cultural environment (Bolling et al., 2018). Numerous implications have been mentioned, and could be allocated at multiple levels, as shown in Figure 8.1.

At the individual level (e.g., the dancer), interventions aimed at reducing stress levels have the potential to reduce the burden of dance injuries, both for injury prevention and rehabilitation. Interventions could be based on, for instance, relaxation, mindfulness and acceptance (e.g., MAC/ACT interventions). Moreover, psychological guidance could support individual dancers.

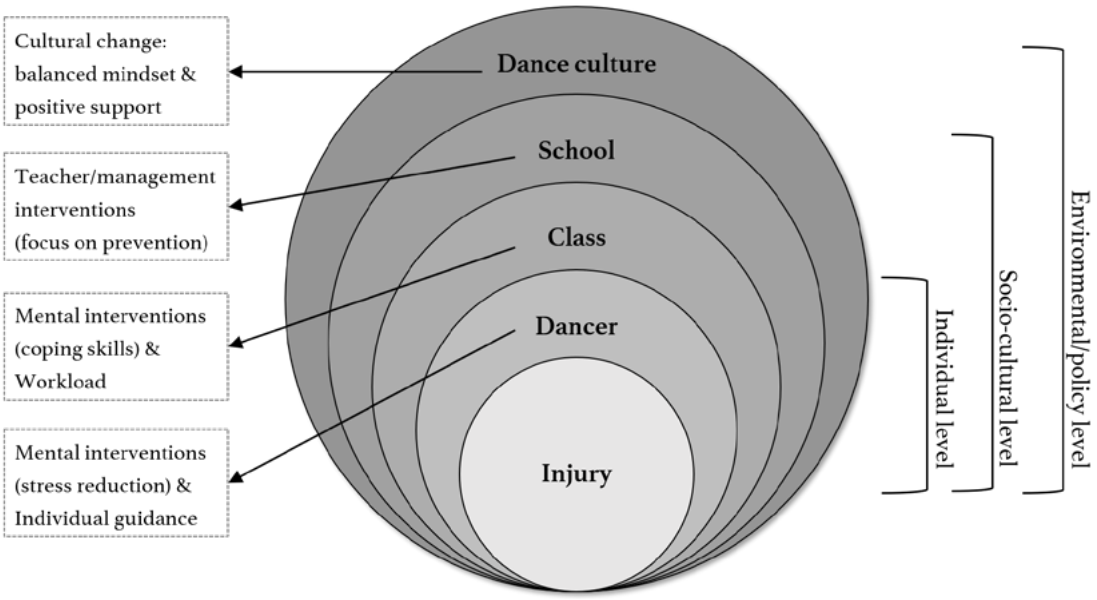


Figure 8.1 A socioecological view of injuries that includes context at multiple levels, i.e., individual, sociocultural and environmental (adapted from Bolling et al., 2018).

When psychological support is available within the dance school, it is important to stay aware of the stigma around mental health, as, for instance, visiting a psychologist within the school may be more visible to classmates and teachers, which can result in discomfort for the individual.

At the social-cultural level (i.e., the dance class/school), broader interventions could be implemented. For instance, a group-based coping skill intervention could be included within the dance curriculum. By incorporating important elements in their current education, we can teach the new generation of dancers and dance teachers a different mindset and different ways to cope (i.e., a bottom-up approach). The most important aspect is to raise awareness of the negative effects of stress and lack of coping skills among students (i.e., why do we need to learn this?), as awareness is the first step in behavioural change. In addition, information about the potential benefits of preventive behaviours, combined with reflections and practical exercises, might influence students' motivation to engage in the exercises and injury preventive behaviours; leading to changes in their attitudes and beliefs about behaviours and actions related to injury prevention (Ivarsson et al., 2017). Overall, teaching coping skills, such as visualisation, goal setting and relaxation techniques, to replace potentially harmful coping mechanisms, such as denial, before they sustain an injury could be very useful (Pollitt & Hutt, 2021).

Furthermore, preventive measures for injuries on the social-cultural level should mainly focus on the back and lower extremities, for instance, by looking more closely at the specific workload for the lower extremities (e.g., jumps) across the curriculum and using periodisation strategies. It is also important to examine the general workload and stressors as (constant) tiredness, together with stress and anxiety, are the most mentioned mental health problems. Moreover, aiming interventions especially at students who are at-risk, for instance younger students, students with a relatively high BMI and students with limited coping skills, could result in better injury prevention.

Additionally, interventions aimed at current dance teachers could improve the environment of dance students. Dance teachers should be better equipped with handling injured students, for example, by being taught about injury risks and causes, and the psychological impact of injuries. Furthermore, when dance teachers learn more about coping skills and stress reduction, they can use this on a personal level and incorporate them into their communication and teaching, demonstrating an important example to the students.

Finally, and most importantly, at the environmental/policy level, the whole dance culture should accept a more 'balanced' mindset, whereby hard work is validated, but the importance of rest is also propagated by important stakeholders (e.g., teachers, school directions, dance companies etc.). Interventions should lead to changes in organisational culture and environment through clear and transparent policy structures (Gorczynski et al., 2021).

Furthermore, experts statements on mental health in elite sports have highlighted the importance of improving mental health literacy across all levels (Gorczynski et al., 2021). This thesis could contribute to the culture shift by increasing awareness and literacy within contemporary dance. A recent study showed that most pre-professional dance schools provide some health-related information. However, the covered topics did not always align with what stakeholders (i.e., dancers, educators, and administrators) indicated to be the most important, such as injury management and psychology (Kozai & Ambegaonkar, 2020).

Moreover, positive support for dance students is essential during injury rehabilitation. Reassuring dancers that it is safe, beneficial and appropriate to reveal injuries and take time to recover, while also being realistic about potential consequences, is needed (Vassallo et al., 2019). More (prominent) dancers have started to share their experiences of injury rehabilitation and time off in the media, which may help to further reduce stigma (Vassallo et al., 2019).

In addition, Drury (2018) demonstrated the impact of a support group intervention for injured dancers by reducing unwanted isolation and providing strategies for stress reduction and healing.

To close, in general, applied psychology and the provision of mental health support is still absent from the dance context (Clements, 2021). (Sport) psychological support as an extension of the provided physical support is, therefore, warranted across all levels in dance.

Overall conclusions

The main goal of this thesis was to develop knowledge on the incidence and characteristics of physical (i.e., injuries) and mental health problems, as well as identifying mental risk factors for injuries and understanding dancers' responses during injury rehabilitation. The findings indicated a high injury IP. The most common injuries involved the ankle, lower back and knee. Furthermore, contemporary dance students are at risk of mental health problems, specifically stress, anxiety, and (constant) tiredness. During the COVID-19 lockdown, the prevalence of mental health complaints increased for all performing arts students, although they perceived less stress and their sleep quality increased. Factors associated with increased likelihood for dance injuries were limited coping skills, lower age, and higher BMI. Moreover, our studies indicated an association between stress levels and injuries.

Qualitative analysis indicated that dancers' beliefs regarding the demanding and performance-focused culture of dance and its schooling system resulted in highly perceived pressure, which influenced strategies to continue dancing while being substantially injured.

Time pressure and uncertainties about their injury course made it more difficult to effectively cope with their injury and listen to their body's needs. Overall, injury management was induced by feedback from others or insufficient recovery trajectories, in which students adjusted their coping behaviours based on injury consequences. Eventually, students learned the importance of (body) awareness, having a positive mindset, social support and focusing on their future health.

This thesis highlights that there is no simple solution towards prevention. Therefore, health care calls for a continuous process of learning and improving. As such, we encourage further research and development in the prevention of health problems in contemporary dance students. More research with larger sample sizes and more frequent measurements, especially to gain insight into mental risk factors for (mental) health problems, is needed.

Furthermore, it is recommended to work towards developing and teaching effective coping skills to contemporary dance students in order to teach students to better cope with stress (i.e., stress reduction) and their beliefs about dance. As not all injuries can be prevented, coping skills might enable them to intervene early when they do sustain an injury. Moreover, looking into the workload and improving mental health literacy could benefit the contemporary dance population. Finally, a cultural change is still needed, in which hard work and rest are balanced in an appropriate way.

Appendix 'Towards a new intervention'

The stress-and-injury model of Williams and Andersen (1998) explicitly states that interventions aimed at physiology (e.g., relaxation) and attention (e.g., mindfulness) should be beneficial in reducing the stress response and injury risk. Mindfulness training directly addresses the stress response and the physiological and attentional changes that may lead to injury (Ivarsson et al., 2017). The central concept of mindfulness is paying attention to what is happening in the present moment and to acknowledge current states (e.g., anxiety) but not becoming fused with those states, which usually leads to downregulation of stress-related brain activations (Ivarsson et al., 2015, 2017).

Overall, mindfulness- and acceptance-based behavioural interventions have become more popular in sport psychology and have gained more support in basic and applied research over the past 20 years (Gardner & Moore, 2017; Shortway et al., 2018), especially in enhancing athlete performance and well-being. The mindfulness- and acceptance-based models go beyond mindfulness alone and promote full awareness and non-judgemental acceptance of one's internal state, task-focused attention and a steady and determined value-driven personal commitment to behaviours that are in line with one's values and desires (Gardner, 2016). One of the new, promising approaches within psychology building beyond mindfulness is Acceptance and Commitment Therapy (ACT) (Hayes, 2004). ACT is an evidence-based treatment for, among others, chronic pain, depression, and anxiety, according to the Society of Clinical Psychology (Shortway et al., 2018). ACT focuses on six core processes through the use of acceptance, mindfulness and behaviour change strategies, namely: contact with the present moment, values, committed action, acceptance, cognitive defusion, and self as context (Hayes et al., 2006). Together these processes increase psychological flexibility: "the ability to contact the present moment more fully as a conscious human being, and to change or persist in behaviour when doing so serves valued ends" (Hayes et al., 2006, p. 7).

Psychological flexibility and mindfulness are related to health, for instance, in self-regulated behaviour and positive emotions (Brown & Ryan, 2003). Moreover, Kangas and McDonald (2011) indicated that ACT might be more effective than more traditional techniques (e.g., cognitive behavioural therapy), as people can engage in meaningful behaviour and experience physical issues or difficult emotions. Moreover, research supports using mindfulness- and acceptance processes and psychological flexibility as mechanisms of behavioural change for people with chronic pain, including adolescents (Dahl et al., 2004; Day et al., 2014; McCracken & Gutiérrez-Martínez, 2011; Wetherell et al., 2011; Wicksell et al., 2005).

Within sports, the Mindfulness-Acceptance-Commitment (MAC) intervention is the first and empirically researched example based on the principles of ACT. The MAC protocol contains seven modules, including (1) psycho-education; (2) mindfulness and cognitive defusion; (3) values and values-driven behaviour; (4) acceptance; (5) commitment; (6) skill consolidation and poise (which combines mindfulness, acceptance, and commitment); and (7) maintaining and enhancing mindfulness, acceptance, and commitment (Gardner & Moore, 2007). MAC has been shown to increase overall psychological and general well-being of (sports) performers (Gardner & Moore, 2007) and appears to be an effective intervention when compared to more traditional psychological skills training (PST) by, for instance, reducing emotion dysregulation (Gross et al., 2018). Participants following the MAC approach showed reduced generalised anxiety, eating concerns, and psychological distress, as well as increased psychological flexibility (Gross et al., 2018).

However, there is a lack of application of ACT principles in sports injury rehabilitation (Shortway et al., 2018). Within dance, these approaches have not been investigated at all, to our knowledge. However, preliminary results within sports are promising. When combining these promising results from the literature with our results, we could see great overlap between the broad-based coping skills we included in our research and the framework of ACT. Working with ACT towards more psychological flexibility could possibly lead to an increase in active coping skills, and therefore, reduced injury risk. If we look in more detail towards the broad-based coping skills (R. E. Smith et al., 1995) we included in our research, and the six core processes of ACT (Hayes et al., 2006), the following can be observed:

- *Coping With Adversity:* indicates that a dancer remains positive and calm even when things are going badly, and can quickly bounce back from setbacks. This subscale shows 'psychological flexibility' as a whole.
- *Coachability:* indicates that a dancer is open to instruction, and accepts constructive criticism without taking it personally and becoming upset. This subscale shows if a dancer is able to accept his or herself with all of his/her (positive or negative) aspects, to accept and see his/herself separate from his/her thoughts, feelings and sensations in order to accept internal experiences as temporary and nonthreatening (i.e., 'self as context') (Shortway et al., 2018), and is able to convert feedback into 'committed action'.
- *Concentration:* indicates whether a dancer becomes easily distracted, and is able to focus on the task at hand, even when unexpected situations occur. This subscale specifies 'contact with the present moment', being fully aware and focused.

- *Confidence and Achievement Motivation:* indicates that a dancer is confident, positively motivated and works hard to improve his or her skills. This subscale shows the engagement in the direction of what is important at that point in one's accomplishments by working towards their 'values' (i.e., what they find important), as well as 'self as context', accepting internal experiences as temporary and non-threatening.
- *Goal Setting and Mental Preparation:* indicates that a dancer sets and works towards specific goals, plans and mentally prepares for performances, indicating the 'committed action' to work towards their values.
- *Freedom From Worry:* indicates if a dancer puts pressure on him/herself by worrying about making mistakes and what others will think if he/she performs poorly. This subscale is in line with 'fusion' and 'defusion' with our own thoughts. We can overly accept our own thoughts as the truth (cognitive fusion), which stimulates avoidance behaviour when these thoughts are worrying (Hayes, 2004). Whereas, within 'cognitive defusion' the experiential point is that thoughts do not mean what they say they mean (Hayes, 2004), giving you the ability to see your thoughts from a distance, as just 'thoughts'. The power of thoughts becomes less intimidating, especially in stressful situations.
- *Peaking Under Pressure:* indicates if a dancer is challenged rather than threatened by pressure and performs well under pressure. This subscale indicates the combination between acceptance, 'self as context', 'cognitive defusion', as well as 'committed action'. It shows that a dancer is able to focus on specific behaviour under difficult circumstances (i.e., pressure).

Concluding, interventions based on ACT could probably increase broad-based coping skills, however, there is not yet sufficient research within injury rehabilitation to validate this.

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Summary

Summary

Health problems are very disadvantageous for contemporary dance students. Besides, dance students are at a high risk for sustaining a health problem due to the demanding physical, psychological and artistic aspects of dance training. Prevention is therefore essential. However, little is known about physical (i.e., injuries) and mental health problems. Therefore, this thesis' goal was to develop knowledge on incidence, characteristics, risk factors of and responses to injuries in contemporary dance students, as well as the incidence and characteristics of mental health problems. A longitudinal study including multiple cohorts, and a qualitative study were conducted to establish this knowledge.

Incidence and characteristics of injuries

Overall, 97% of the contemporary dance students reported at least one health problem during one academic year ***(Chapter 2)***. Furthermore, a one-year injury incidence proportion (IP) of 81% was found. Results showed that 58% of the injured students suffered from a substantial injury (i.e., leading to moderate or severe reductions in training volume or moderate, severe, or complete reductions in performance) ***(Chapter 2)***. The monthly IP of all injuries ranged from 23% to 43% and for substantial injuries from 6% to 17% during one academic year. The injury incidence rate per 1,000 hours dance exposure was 1.9 (95% CI 1.7 to 2.2). Hence, these results highlight the need for injury prevention in contemporary dance students. The most common injuries involved the ankle/foot (30%), lower back (15%) and knee (14%). Injury prevention programmes in dance schools should, therefore, focus on these body regions.

Incidence and characteristics of mental health problems

A one-year IP of 45% was shown for all reported mental health problems among contemporary dance students ***(Chapter 3)***. Furthermore, 29% of the students reported a mental health problem as their most severe health problem, over a physical injury or other health problem. Of these students, 39% was suffering from a substantial mental health problem. The monthly IP of mental health problems characterized as the most severe health problem ranged from 3 to 9%, and from 0 to 5% for substantial mental health problems during one academic year.

Dance-teacher students compared to dance students, and second-year students from both educational programmes compared to first- or third-year students, indicated significantly more mental health problems, while there were no significant differences in sex. The most reported types of mental health problems were general anxiety (20%), stress due to external factors (18%), and constant tiredness (17%).

Dance schools should, therefore, pay special attention to these mental health problems, as well as to students from the Bachelor Dance Teacher and second-year students.

Besides the 'regular' incidence proportions of mental health problems, we analysed the effect of the strict lockdown prevention measures taken by the Dutch government due to global pandemic of the corona virus disease (COVID-19) ***(Chapter 7)***. Overall, the IP of mental health problems of all performing arts students (i.e., Bachelors in Dance, Dance Teacher, Circus Arts, and Music Theatre) was negatively affected by the COVID-19 lockdown restrictions.

A positive side-effect from the lockdown was that students perceived less stress and their sleep quality increased. However, the 3-month IP of mental health problems was significantly higher during the COVID-19 lockdown compared to two pre-COVID-19 periods. Besides, at least 76% students dealt with moderate to very severe loneliness in all three 'lockdown months'.

Injury risk factors

Several risk factors of dance injuries have been identified. Limited coping skills (i.e., the way students deal with stress and problems), as well as lower age and higher BMI, were found to be associated with an increased risk of sustaining a substantial injury ***(Chapter 4)***. In total, the multivariate model explained 24% of the variance in the substantial injury group.

More specifically, with every point higher on the total coping score (range 0 – 84) students are 9% less likely to sustain an injury, which is in line with previous literature within sports and dance. Moreover, with each year older students are 33% less likely to sustain an injury, and with every point higher on BMI, students are 38% more likely to sustain an injury. Furthermore, a non-significant trend was shown, suggesting students without an injury history are less likely to sustain an injury. No significant results were found for perfectionism and self-regulation as potential risk factors, possibly due to an indirect effect of both aspects on the relationship between stress and injury. Dance schools could consider including coping skills training as part of injury prevention programmes and, perhaps, providing special attention to younger dancers and those with a higher BMI through transitional programmes to assist them in managing the stress they experience throughout their (academic) career.

Furthermore, we found an association between general stress levels and injuries among first-year contemporary dance students ***(Chapter 5)***, in line with the stress-and-injury model (Williams & Andersen, 1998). An overall average monthly general stress score of 39.8 (range 0 – 100) was shown, with monthly stress scores ranging from 31.75 to 49.16.

Between-subject analysis indicated that, overall, injured students reported higher stress scores than injury-free students. Although, not all of the monthly stress scores differed significantly. Within the 3-month period before and during injury occurrence, a significant linear effect of stress scores increasing from the injury-free to the injury period was found. More research is needed to further unravel the link between stress and dance injuries. Yet, better management of workload and a focus on the possible effects of stress in dance students by including psychological training programmes, for instance based on mindfulness, might have the potential to reduce the burden of dance injuries and may have positive outcomes for dancers, teachers, schools and companies.

Psychosocial responses during injury rehabilitation

It is assumed that dancers often do not fully recover from their initial injury, since they are likely to ignore an injury. Therefore, we examined the psychosocial responses of contemporary dance students during their injury rehabilitation process using semi-structured interviews ***(Chapter 6).***

Results showed that cognitive appraisals of the demanding and performance-focused culture of dance resulted in highly perceived pressure and negative emotions. Moreover, being part of a school system with a limited timeframe to achieve goals increased this pressure. Generally, students showed constructive coping behaviour strategies to (mentally) feel better. However, they also revealed non-constructive strategies to continue dancing as a result of the previously mentioned pressure, with possible long-term consequences. Alongside this, time pressure and uncertainty about their injury course also negatively impacted their emotional responses, coping strategies and ability to listen to their body's needs. Furthermore, injury management, induced by feedback from others or insufficient recovery trajectories, indicated how students adjusted their coping behaviours based on injury consequences. Additionally, results showed that students learned the importance of (body) awareness, having a positive mindset, social support and focusing on their future health. To conclude, the main results showed that coping behaviours were often influenced by the beliefs students have around the 'hard' culture of dance, in line with the 'integrated model of response to sport injury' (Wiese-Bjornstal et al., 1998).

Contemporary dance students should be taught more about pain appraisal, body awareness, the influence of their thoughts and emotions on their behaviours and the importance of reinforcing their own boundaries. Overall, learning about the negative effects of stress and lack of coping skills can help balance the short-term benefits and long-term consequences of continuing to dance when stressed, tired or in pain.

Furthermore, providing positive support for dance students is essential during injury rehabilitation. Besides, dance teachers should be better equipped with handling injured students.

Practical recommendations

This thesis' results provide guidelines for monitoring and preventing health problems among contemporary dance students. Preventive measures aiming at the mental aspects of dance injuries could focus on lowering stress levels. Furthermore, it is recommended to work towards developing and teaching effective coping skills for dance students, in order to teach students to better cope with stress and their beliefs surrounding dance. As not all injuries can be prevented, coping skills might enable them to intervene early when they do sustain an injury. Interventions aiming at reducing injury risk and improving rehabilitation could be based on, for instance, visualization, relaxation, mindfulness and acceptance (e.g., the Mindfulness-Acceptance-Commitment protocol or Acceptance Commitment Therapy, see appendix 'Towards a new intervention').

In order to address the complexity of health problems, interventions should be aiming at different levels (i.e.,, individual, socio-cultural and environmental). At the individual level, interventions to reduce stress levels and provide psychological guidance could have the potential to reduce the injury burden. At the social-cultural level, group based interventions could be implemented. Managing the workload is important, whereas implementing a group-based coping skill intervention and teaching students more about the negative effects of stress and lack of coping skills could also be beneficial. Besides, dance teachers and schools should be trained in handling injured students by learning about injury risks and causes and the psychological impact of injuries. Finally, at the environmental level, a cultural change is still needed, in which hard work and rest are balanced in an appropriate way. For instance, via improving mental health literacy and providing positive support for injured dancers.

Conclusion

The main goal of this thesis was to develop knowledge on incidence and characteristics of mental health problems and injuries, as well as identifying mental risk factors of injuries and understanding dancers' responses during injury rehabilitation. The findings indicated that contemporary dance students are at high risk for sustaining an injury and at moderate risk for mental health problems. Especially lower back and lower-extremity injuries were present (ankle/foot and knee), whereas anxiety, stress, and tiredness were the most common mental health problems. Furthermore, the prevalence of mental health problems was negatively affected by the COVID-19 lockdown restrictions.

Factors associated with increased likelihood for dance injuries were limited coping skills, lower age and higher BMI. Besides, an association between stress levels and injuries has been indicated, however more research on this topic is needed.

Dancers' beliefs regarding the 'hard' culture of dance and its schooling system resulted in highly perceived pressure, which influenced strategies to continue dancing while being substantially injured. Time pressure and uncertainties about their injury course made it more difficult to effectively cope with their injury and listen to their body's needs. Overall, injury management (i.e., adjusting coping behaviours based on injury consequences) was induced by feedback from others or insufficient recovery trajectories. Eventually, students learned the importance of (body) awareness, having a positive mindset, social support and focusing on their future health.

This thesis highlights that there is no simple solution towards prevention. Therefore, health care calls for a continuous process of learning and improving at multiple levels. As such, we encourage further research and development in the prevention of health problems in contemporary dance students, for instance on intervention programmes directing towards (teaching) effective coping skills, optimizing workload and improving mental health literacy. Finally, a cultural change within dance is still needed, in which hard work and rest are balanced in an appropriate way.

Samenvatting

Samenvatting

Studenten hedendaagse dans (in het Engels 'contemporary dance' genoemd) lopen een groot risico op gezondheidsklachten, zoals blessures, stress- en angstklachten. Dit komt onder andere door hun intensieve dansopleiding met hoge fysieke, mentale en artistieke eisen, zoals lange trainingsdagen, veel optredens en lastige choreografieën. Deze gezondheidsklachten kunnen grote gevolgen hebben voor hun persoonlijke en professionele ontwikkeling. Preventie is daarom essentieel. Er is echter weinig bekend over de fysieke gezondheidsklachten (oftewel blessures) en mentale gezondheidsklachten bij dansstudenten. Het doel van dit proefschrift was om meer inzicht te krijgen in de omvang en kenmerken van fysieke en mentale gezondheidsklachten, risicofactoren van blessures én de manier waarop dansstudenten omgaan met hun blessures. Een longitudinale studie met meerdere cohorten en een kwalitatieve studie maken deel uit van dit onderzoek.

Omvang en kenmerken van blessures

Van alle dansstudenten bleek 97% tenminste één fysieke of mentale gezondheidsklacht te ervaren binnen één volledig schooljaar ***(Hoofdstuk 2)***. In totaal raakte 81% van de dansstudenten geblesseerd gedurende het schooljaar. Van deze geblesseerde studenten was 58% substantieel geblesseerd, wat inhoudt dat hun blessure ervoor heeft gezorgd dat ze hun trainingsomvang (bijvoorbeeld danslessen of optredens) hebben moeten verlagen en/of minder goede of helemaal geen prestaties meer konden leveren ***(Hoofdstuk 2).*** De maandelijkse omvang van alle blessures varieerde van 23% tot 43% en voor substantiële blessures van 6% tot 17% gedurende één schooljaar. De blessure-incidentie ratio (dat wil zeggen de verhouding van het aantal blessures ten opzichte van de hoeveelheid uren die een student danst) per 1,000 uur dans was 1.9 (95% CI 1.7 – 2.2). Deze resultaten geven aan dat aandacht voor blessurepreventie bij studenten hedendaagse dans essentieel is.

De meest voorkomende blessurelocaties waren de enkel/voet (30%), onderrug (15%) en knie (14%). Blessurepreventieprogramma's binnen opleidingen voor hedendaagse dans moeten zich dan ook vooral op deze lichaamsdelen richten.

Omvang en kenmerken van mentale gezondheidsklachten

Gedurende het schooljaar rapporteerden 45% van de studenten minimaal één mentale klacht ***(Hoofdstuk 3)***. Van alle studenten gaf 29% een mentale klacht aan als hun meest ernstige klacht, boven een blessure of andere gezondheidsklacht (bijvoorbeeld ziekte). Van deze studenten bleek 39% een substantiële mentale klacht te ervaren, met duidelijke gevolgen voor de trainingsomvang en prestaties.

De maandelijkse omvang van mentale klachten als meest ernstige klacht varieerde van 3% tot 9% en voor substantiële mentale klachten van 0 tot 5% gedurende één schooljaar.

Studenten van de opleiding Docent Dans hadden significant meer mentale klachten dan de studenten van de opleiding Uitvoerend Dans. Tweedejaarsstudenten van beide opleidingen gaven meer klachten aan dan eerste en derdejaarsstudenten. Mannen en vrouwen van beide opleidingen rapporteerden evenveel klachten. De meest genoemde mentale klachten waren algemene angst (20%), stress als gevolg van externe factoren zoals een verhuizing of overlijden (18%) en constante vermoeidheid (17%). De resultaten laten zien dat het goed zou zijn als dansopleidingen extra aandacht hebben voor de angst-, stress- en vermoeidheidsklachten van de dansstudenten. Ook is het goed om bij studenten van de opleiding Docent Dans en bij tweedejaarsstudenten van beide opleidingen meer focus op de mentale gezondheid te hebben.

Verder is onderzocht wat de invloed was van de strikte maatregelen die door de Nederlandse overheid zijn genomen als gevolg van het coronavirus (COVID-19) ***(Hoofdstuk 7)***. De mentale gezondheid van dans-, circus- en muziektheaterstudenten verslechterde door de COVID-19 'lockdown' restricties. De omvang van mentale gezondheidsklachten in de lockdown-periode was significant hoger ten opzichte van de periodes daarvoor. En 76% van de studenten bleek zich (gemiddeld tot zeer ernstig) eenzaam te voelen. Een positief effect van de lockdown was dat studenten minder stress ervaarden en dat hun slaapkwaliteit verbeterde.

Risicofactoren voor blessures

In dit proefschrift is onderzocht welke factoren van invloed zijn op het ontstaan van een blessure. Beperkte vaardigheden om met stress en problemen om te gaan (in het vervolg aangeduid als copingvaardigheden), jongere leeftijd en een hoger BMI verhoogden het blessurerisico ***(Hoofdstuk 4).*** Deze factoren verklaarden samen voor 24% of een student wel of niet geblesseerd raakt gedurende het schooljaar. Dit geeft aan dat verder onderzoek naar risicofactoren nodig is om beter inzicht te krijgen in waarom een dansstudent geblesseerd raakt.

Als we elke risicofactor apart bekijken bleek dat wanneer studenten één punt hoger scoorden op de totale copingscore (range 0 – 84) en dus beter waren in coping, ze 9% minder kans hadden op een blessure. Dit komt overeen met eerder onderzoek in dans en sport. Wanneer studenten één jaar ouder waren, hadden ze 33% minder kans op een blessure. Een stijging in BMI met één punt zorgde voor 38% meer kans op een blessure.

Daarnaast heeft een blessurevoorgeschiedenis vermoedelijk ook invloed op het blessurerisico; hier was een niet-significante trend zichtbaar. Perfectionisme en zelfregulatie waren niet van invloed op het blessurerisico. Dit zou wellicht kunnen komen doordat beide factoren een mogelijk effect hebben op de relatie tussen stress en blessures, in plaats van direct op het ontstaan van blessures. Dit proefschrift geeft aan dat het belangrijk is voor dansopleidingen om aandacht te besteden aan copingvaardigheden om het blessurerisico te verlagen. Een specifieke focus op jonge dansers en op dansers met een hoog BMI kan hierbij verstandig zijn. Onder andere door een gericht programma aan te bieden om hen te ondersteunen bij het omgaan met stress en problemen binnen hun (academische) danscarrière.

Verder is in dit proefschrift de specifieke relatie tussen stress en blessures onderzocht. De resultaten toonden een associatie tussen het algemene stressniveau en blessures bij eerstejaarsstudenten hedendaagse dans ***(Hoofdstuk 5)***. Dit is in overeenstemming met het 'stress-and-injury model' van Williams en Andersen (1998). De gemiddelde maandelijkse algemene stressscore was 39.8 (range 0 – 100), met maandelijkse stressscores variërend van 31.75 tot 49.16. Geblesseerde studenten rapporteerden over het algemeen hogere stressscores dan hun niet-geblesseerde medestudenten. Al waren niet alle gemiddelde maandelijkse scores van geblesseerde studenten significant hoger. In de periode voor en tijdens het ontstaan van een blessure nam stress significant toe van de blessurevrije, naar de pre-blessure tot de blessuremaand. Meer onderzoek is echter nodig om de relatie tussen stress en dansblessures verder te ontrafelen. Deze resultaten tonen aan dat focussen op de effecten van stress kan helpen om de last van dansblessures te verkleinen. Ook kan een betere verdeling van inspanning (bijvoorbeeld werklast) en rust helpen om stress te verminderen. Wat uiteindelijk weer een positief effect kan hebben op de blessurelast voor dansstudenten en dansopleidingen. Dit kan onder andere door mentale trainingsprogramma's aan te bieden, bijvoorbeeld gebaseerd op mindfulness.

Het omgaan met dansblessures

Dansers blijken vaak door te dansen ondanks een blessure. Hierdoor wordt er gedacht dat ze vaak ook niet goed herstellen van een eerste blessure. Om meer inzicht te krijgen in hoe dansers omgaan met een blessure zijn verschillende geblesseerde dansstudenten geïnterviewd ***(Hoofdstuk 6).***

De manier waarop dansstudenten dachten over de veeleisende, prestatiegerichte danscultuur zorgde ervoor dat ze veel druk en negatieve emoties ervaarden. Onderdeel zijn van een schoolsysteem leidde tot extra druk bij studenten, door de beperkte tijd om hun doelen te bereiken en goede cijfers te halen.

De kwalitatieve analyses toonden aan dat studenten beschikten over bepaalde constructieve copingstijlen om zich (mentaal) beter te voelen. Door de ervaren druk lieten ze echter ook niet-constructieve copingstijlen zien om toch door te kunnen dansen ondanks hun blessure, met mogelijk ernstige langetermijngevolgen. Tijdsdruk en onzekerheid over hun blessureverloop hadden een negatieve invloed op hun emoties, copingstijlen en het vermogen om naar hun lichaam te luisteren. Feedback van anderen over de consequenties van hun blessure (bijvoorbeeld het verergeren van de klacht) of onvoldoende herstel in hun blessuretraject zorgde er uiteindelijk voor dat studenten hun copingstijlen aanpasten. Tijdens de blessureperiode hebben studenten geleerd dat (lichaams) bewustzijn, een positieve mindset, sociale steun en een focus op hun gezondheid in de toekomst belangrijk zijn. Deze resultaten toonden aan dat de manier waarop studenten omgaan met hun blessure werd beïnvloed door de overtuigingen die studenten hebben over de 'harde' danscultuur. Dit is in overeenstemming met het 'integrated model of response to sport injury' van Wiese-Bjornstal en collega's (1998).

Dit proefschrift toont aan dat het belangrijk is dat dansstudenten meer leren over pijnervaringen, (lichaams)bewustzijn, de invloed van hun gedachten en emoties op hun gedrag en het belang van grenzen stellen. Kennis over de effecten van stress en verminderde copingvaardigheden kan studenten helpen een goede afweging te maken tussen de korte- en langetermijngevolgen van blijven dansen terwijl ze stress, vermoeidheid of pijn ervaren. Positieve steun vanuit de sociale omgeving aan geblesseerde studenten is essentieel. Als laatste is het van belang dat dansdocenten beter leren omgaan met geblesseerde studenten.

Praktische aanbevelingen

Dit proefschrift geeft belangrijke inzichten in het monitoren en voorkomen van fysieke en mentale gezondheidsklachten bij studenten hedendaagse dans. Binnen het mentale vlak van blessurepreventie is het van belang om te focussen op het verminderen van stress. Het is daarbij essentieel om te werken aan effectieve copingstijlen voor dansstudenten. Hierdoor kunnen studenten beter leren omgaan met de effecten van stress en hun overtuigingen gericht op de danswereld. Ook kunnen copingvaardigheden studenten helpen om eerder in te grijpen in een blessuretraject en om hun gedrag aan te passen waar nodig, aangezien niet alle blessures voorkomen kunnen worden. Interventies voor het verminderen van blessurerisico en het verbeteren van blessureherstel kunnen onder andere gebaseerd worden op visualisatie, ontspanning, mindfulness en acceptatie (bijvoorbeeld het Mindfulness-Acceptance-Commitment protocol of Acceptance Commitment Therapy, zie appendix 'Towards a new intervention').

Om de complexiteit van gezondheidsklachten goed aan te pakken is het noodzakelijk om dit op verschillende niveaus te doen. Op het individuele niveau kunnen interventies voor het verminderen van stress en het aanbieden van psychologische begeleiding helpen om de last van blessures te verlagen. Op sociaal niveau zijn verschillende groepsinterventies mogelijk. Zo is het belangrijk om inspanning en rust goed te verdelen. Ook kunnen lessen over de effecten van stress en verminderde copingvaardigheden en specifieke copingvaardighedentrainingen bijdragen aan minder gezondheidsklachten. Het is erg belangrijk dat dansopleidingen en -docenten beter leren omgaan met geblesseerde studenten door meer kennis op te doen over de risico's, oorzaken en impact van blessures. Op omgevingsniveau is een cultuurverandering nodig, gefocust op een goede balans tussen hard werken en voldoende rust. Dit kan bereikt worden door onder andere het vergroten van de kennis over mentale gezondheid en het aanbieden van positieve steun aan geblesseerde dansers.

Conclusie

Het doel van dit proefschrift was om meer kennis te verkrijgen over de omvang en kenmerken van fysieke en mentale gezondheidsklachten, risicofactoren van blessures én de manier waarop dansstudenten omgaan met hun blessures. Onze resultaten gaven aan dat studenten hedendaagse dans een groot risico hebben op blessures en een gemiddeld risico op mentale gezondheidsklachten. Vooral blessures aan de onderrug en benen werden gerapporteerd, net als angst-, stress- en vermoeidheidsklachten. Verder is gebleken dat de mentale gezondheid verslechterde door de COVID-19 lockdown restricties. Ook toonden onze resultaten aan dat beperkte copingvaardigheden, jongere leeftijd en een hoger BMI risicofactoren zijn voor blessures. Daarnaast is er een relatie tussen stress en blessures gevonden; meer onderzoek naar deze relatie is echter nodig.

De overtuigingen die dansers hebben rondom de 'harde' danscultuur en het schoolsysteem bleken te zorgen voor veel druk. Deze druk beïnvloedde manieren om toch door te kunnen dansen ondanks een blessure. Tijdsdruk en onzekerheid over het blessureverloop maakten het nog lastiger voor studenten om goed om te gaan met hun blessure en naar hun lichaam te luisteren. Uiteindelijk zorgde feedback van anderen over de consequenties van hun blessure of onvoldoende herstel in hun blessuretraject ervoor dat studenten hun copingstijlen aanpasten. Tijdens de blessureperiode hebben studenten het belang van (lichaams)bewustzijn, een positieve mindset, sociale steun en een focus op hun gezondheid in de toekomst geleerd.

Dit proefschrift toont aan dat er geen simpele oplossing is voor de preventie van gezondheidsklachten. Daarom is het binnen de gezondheidszorg en danswereld erg belangrijk om te blijven ontwikkelen op verschillende niveaus. Toekomstig onderzoek en ontwikkeling binnen de preventie van gezondheidsklachten bij dansstudenten wordt dan ook van harte aangemoedigd. Bijvoorbeeld door onderzoek te doen naar interventieprogramma's gericht op (het aanleren van) effectieve copingvaardigheden, maar ook het verder optimaliseren van de werklast en het vergroten van de kennis over mentale gezondheid. Als laatste is een cultuurverandering binnen de danswereld nog steeds nodig, met uiteindelijk een optimale balans tussen hard werken en voldoende rust.

Dankwoord

“Hou vol hou vast
Er is altijd nog m’n arm die om je heen past
En altijd nog m’n schouder die je recht houdt
Al is het maar voor even”

Hou Vol Hou Vast - Bløf

Zoals jullie wellicht begrijpen heb ik dit proces nooit alleen kunnen volbrengen. Ik wil dan ook graag een aantal mensen bedanken die op de een of andere manier een bijdrage hebben geleverd aan de totstandkoming van mijn proefschrift.

Janine
Wat een reis hebben we samen afgelegd! Van masterstudent tot volledige PhD. Onze samenwerking zal gelukkig niet zomaar stoppen. Ik durf wel te zeggen dat je een grote bijdrage hebt geleverd aan mijn ontwikkeling tot de persoon die ik nu ben. Dit ging uiteraard niet zonder slag of stoot, maar geen enkele ontwikkeling gaat in een mooie rechte lijn. Bedankt voor het vertrouwen dat je in me had, je altijd kritische blik, de interventies om mij tegen mezelf in bescherming te nemen en de zetjes die je gaf om mij maar gewoon dingen te laten proberen, zodat ik mezelf steeds beter leerde kennen en vertrouwen kon opbouwen.

Raôul
Bedankt voor je kritische blik inclusief talloze puntjes op de i, je oprechte interesse, je goede zorgen wanneer dit nodig was en je positieve aanmoedigingen. Het was fijn om je aan boord te hebben!

Geert
Dank voor het, achter de schermen, in goede banen leiden van dit project en het bieden van de mogelijkheden om volledig mijn eigen inzichten en ideeën kwijt te kunnen.

Reading committee and reviewers

Thank you for taking the time to thoroughly read my thesis. I feel very honoured and humbled to have such a knowledgeable and experienced committee assessing my thesis and questioning me over it during my defence. I truly appreciate your efforts.

I would also like to thank all editors and reviewers of my manuscripts who, despite the occasional disappointments of rejections during my process, gave me the important opportunities to improve my work and stimulated me to keep going on.

Anja

Bedankt dat je me met de wondere wereld van kwalitatieve onderzoek kennis heb laten maken. Wat een werk was dat! Maar ik had het voor geen goud willen missen. Bedankt voor je kritische en nieuwsgierige blik, de vragen die je steeds weer terugkaatste zodat ik zelf goed nadacht over het proces en je enthousiasme voor deze mooie kant van onderzoek!

Annemiek

Ik weet nog dat we daar in het Vondelpark stonden, de zomer van 2010. Wie had gedacht dat we nu hier zouden staan? Beide ons eigen pad afgelegd en toch op dezelfde plek geëindigd. Bedankt dat je het zo lang met me uithield en dat je altijd klaar stond om mijn geklaag of mijn tranen (van het huilen én het lachen) op te vangen. Dat is me zoveel meer waard dan dat woorden kunnen aangeven. Maar zeker ook bedankt voor de heerlijke momenten van slap ouwehoeren en ontelbare koffiemomentjes, al waren deze de laatste periode helaas veel te vaak online... En met jou aan mijn zijde ga ik de laatste horde van dit traject met volle overtuiging aan!

Suze

Je was mijn eerste directe collega bij Codarts die me aan de hand mee nam in de, voor mijn gevoel, enorme organisatie die Codarts is. Je rust en geduld waren een mooie tegenhanger van mijn (over)enthousiaste kant. Ook met mijn onzekerheden kon ik altijd goed bij je terecht, bedankt daarvoor! En bedankt dat je aan mijn zijde wil staan tijdens de laatste horde van dit traject.

PEARL (oud-)collega's, en betrokken masterstudenten

Toen ik bij Codarts begon was een specifieke onderzoeksafdeling naar gezondheid nog vooral een hele mooie stip aan de horizon. Binnen vijf jaar tijd is er een geweldig onderzoekslab ontstaan mede dankzij jullie. Bedankt dat ik hier onderdeel van mocht zijn.

Ik heb zoveel van jullie mogen leren, zowel op professioneel als persoonlijk vlak. Mede dankzij jullie is mijn promotietraject succesvol verlopen. Jullie maakten de dagen achter de computer een stuk gezelliger, nog excuses voor mijn eindeloos gepraat en afleidingen. ;-) Ik hoop jullie in de toekomst nog veel tegen te komen!

Dank ook aan de studenten die ons geholpen hebben om data te verzamelen, of dit nu was door ons bij te staan bij de Student Life Monitor, of door volledige interviews af te nemen voor mijn kwalitatieve onderzoek. Daarbij in het bijzonder, bedankt Charlotte! Voor de mooie data die we samen verzameld hebben, maar bovenal bedankt dat je me kennis hebt laten maken met nieuwe kanten van de danswereld, in alle opzichten.

Codarts collega's

Werken bij Codarts was mijn eerste 'echte' baan. Ondanks dat ik me de eerste tijd nog zelf student voelde, heb ik me heel erg thuis gevoeld bij jullie. Van de conciërges tot de docenten waar ik mee samen werkte en natuurlijk de collega's binnen Student Life, bedankt voor de geweldige tijd! Ik heb me menig keer een rijk mens gevoeld in deze inspirerende omgeving en dat is mede dankzij jullie.

Codarts students

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De turnhal-bejaarden

"Gymnastics is not just a sport; it is a way of life" is wat ze wel eens zeggen. Heerlijk afgezaagd, maar ook een beetje waar. Zonder alle vrienden, vriendinnen en sportmaatjes die ik in al die jaren heb verzameld, zou mijn liefde voor sportpsychologie en bewegen nooit zo erg gegroeid zijn en dit proefschrift is hier het levende bewijs van. Al die zondagochtenden klagend op de vloer staan, elkaar weer overeind helpen na de zoveelste keer omvallen; lieve teamgenootjes van toen, bedankt! Ik ben heel blij dat ik jullie nog steeds zo nu en dan spreek en loop over van trots als ik zie waar jullie terecht zijn gekomen en wat voor geweldige personen jullie zijn, stuk voor stuk!

Studiemaatjes

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Daan
Je staat al aan mijn zijde vanaf het moment dat ik in de grote stad ging studeren. Jij was nog zenuwachtiger dan ik, toen je me daar achterliet. Maar gelukkig kwam ik elke keer weer heelhuids terug. ;-) Wat hebben we samen veel meegemaakt. Van verbouwingen tegelijk met afstuderen, tot menig keer waarop ik op instorten stond. Jij was er altijd om me op te vangen, bij elkaar te vegen en af te leiden wanneer dat nodig was. Al was het voor jou soms jammer dat ik dan de leuke buitenklusjes pikte omdat ik echt niet meer na kon denken en even bezig moest zijn met mijn handen. Bedankt voor alles wat ik van jou mag leren.Bedankt voor alle taken die jij op je nam als ik niet meer kon. Bedankt voor het creëren van ons eilandje, ik zit hier heerlijk! Bedankt voor alles. Ik kan me geen ander persoon bedenken die ik naast me zou willen hebben tijdens deze reis. Ik hoop dat we nog heel veel mooie en uitdagende dingen gaan beleven, want samen kunnen we ze aan.

Pleun
Lieve Pleuntje, andere mensen zullen het misschien gek vinden dat jij hier tussen staat, maar één ding weet ik zeker: zonder jou had ik het laatste belangrijke stuk thuiswerken aan dit proefschrift niet overleefd. Bedankt dat je me met je gekke fratsen soms even terug haalde in de normale wereld en dat je me dwong om genoeg pauzes te nemen. Je mag dan nog maar kort deel zijn van ons eilandje, maar ik kan niet meer zonder je!

Tot slot, wat ben ik trots op mezelf!

Hard werken heeft me menig keer op harde wijze laten zien waar mijn grenzen zijn, maar toch heeft het me ook zover gebracht.

Deze reis had ik voor geen goud willen missen!

About the author

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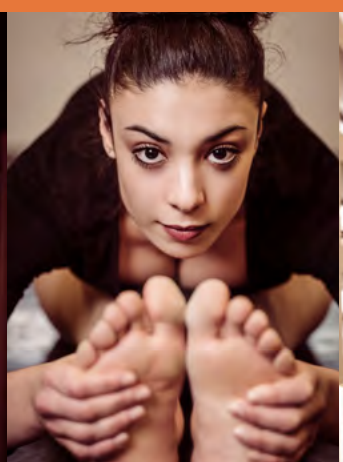
Diana van Winden was born on the 27th of March 1992 in Berkel en Rodenrijs, The Netherlands.

After completing secondary school at Melanchthon College Schiebroek in 2010, she studied Human Movement Science at the Vrije Universiteit Amsterdam. During the final phase of her bachelor, she was drawn towards the psychological aspects of moving and sports. Therefore, she extended her bachelor with one year, following all interesting courses on sports and psychology, as well as starting a 'pre-master' to be able to transfer towards the psychology department of the University of Amsterdam.

The year after she started her master in Sport- and Performance Psychology. During her master thesis and internship, she started working together with the health department of Codarts Rotterdam, University of the Arts. After graduating she started working as a research assistant within the professorship Performing Arts Medicine, and simultaneously started the post-master education to receive an accreditation for applied sport psychology in the Netherlands (SPORTPSYCHOLOOG VSPN®). Her interest in research was sparked, especially in the crossover of physical and mental health. Therefore, she took the opportunity to expand her work within Codarts and the newly established PEARL Research Lab with a PhD thesis. This project was in collaboration with the department of Human Movement Sciences of the Vrije Universiteit. Her supervisors were dr. Janine Stubbe, dr. Raoul Oudejans, and Professor Geert Savelsbergh.






Besides, since 2019 she works as an applied psychologist and sport psychologist within her own practice (www.pamperformance.com) and with a diverse group of individuals. Her clients are mainly based within performing settings, such as employees, students, but also dancers, gymnasts, and the more 'traditional' team sports. She is particularly focused on working with and around injuries, preferably within multi-disciplinary trajectories with (sports) medical professionals, physiotherapists, and dieticians. In January 2022 she started working part-time as a lecturer sport- and performance psychology at the University of Amsterdam.

More than that she is a social person, but also loves to crawl up upon the couch with a book or a great TV-show. She was a (acrobatic) gymnast herself for a very long period, and after a long period of injuries she currently enjoys working out within the CrossFit community. She loves to watch artistic sports and dance, and going for a walk with her dog.

Diana van Winden

Injuries in pre-professional dancers

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