



## Passion and performance anxiety: How it affects the incidence of musculoskeletal disorders in dancers

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### ABSTRACT

**Objectives:** This study aimed to examine the association between the incidence of musculoskeletal disorder episodes (MDEs) and obsessive and harmonious passion as well as performance anxiety throughout a dance season, which lasted 38 weeks.

**Design:** Prospective cohort study.

**Methods:** A total of 118 professional and preprofessional dancers were recruited and assessed at baseline, while 88 completed the follow-up. Their levels of passion and performance anxiety were assessed at the beginning of a dance season using the Passion Scale and the Kenny Music Performance Anxiety Inventory, respectively. To monitor the incidence of MDEs throughout a dance season, dancers were asked to complete a weekly electronic diary.

**Results:** A higher level of obsessive passion was associated with a higher incidence of MDEs causing an interruption of dance activities ( $\beta = 0.264$ ,  $p = 0.022$ ). Harmonious passion and performance anxiety were not associated with MDEs throughout the season.

**Conclusions:** Findings of this study support the role of obsessive passion in the development of MDEs in dancers.

### 1. Introduction

Amateur and professional athletes face a significant risk of sustaining injuries that may affect their occupation and career (Lehman et al., 2020; Mancino et al., 2023). Recent studies have investigated the role of various psychological factors in relation to the incidence of injuries in athletes (Ivarsson et al., 2017; Singh & Conroy, 2017; Smyth et al., 2019; van Iperen et al., 2022). Factors found to have been associated with injuries in athletes include personality, stress, obsessive passion, inadequate coping strategies and competitive anxiety (Ivarsson et al., 2017; Lavallée & Flint, 1996; Smyth et al., 2019; van Iperen et al., 2022).

Compared to the literature on athletes, few studies have evaluated the association between psychological factors and injuries in dancers. Professional and pre-professional dancers are both athletes and artists, who push their minds and bodies in an effort to achieve perfect performances (Nordin-Bates et al., 2017). Similarly to other elite athletes,

dancers are vulnerable to musculoskeletal disorders, which include pain and injuries (S. J. Kenny et al., 2016). Among ballet and contemporary dancers, up to 95% of them will suffer from at least one musculoskeletal disorder episode (MDE) over the span of a season (Caine et al., 2016; Ekegren et al., 2014; Ojofeitimi & Bronner, 2011; Yau et al., 2017). A large proportion of dancers experience musculoskeletal disorders, but research has mainly focused on physical factors. The nature of the different factors contributing to pain and injuries in this population remains unclear.

The few psychological factors that have been investigated include coping strategies, negative stress, psychological distress, passion, and performance anxiety (S.J. Kenny et al., 2016; Mainwaring & Finney, 2017). No significant relationship has been found between coping strategies, negative stress and the incidence of MDEs in dancers (Adam et al., 2004; Byhring & Bo, 2002; Cahalan et al., 2015; Hamilton et al., 1989; Noh et al., 2005). Psychological distress and its different

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components, namely depression, fatigue, difficulties concentrating and anxiety, have been associated with the incidence of MDEs in cross-sectional and prospective studies (Adam et al., 2004; Cahalan et al., 2015; Cahalan & O'Sullivan, 2013; Liederbach & Compagno, 2001; Mainwaring & Finney, 2017; Noh et al., 2005). Conversely, very few studies have investigated the effect of passion and performance anxiety on the incidence of MDEs in dancers (Akehurst & Oliver, 2014; Baadjou et al., 2016; Rip et al., 2006).

The dualistic model of passion suggests that there are two types, obsessive and harmonious passion, which can be measured on two different continua (Vallerand et al., 2003; Vallerand & Rahimi, 2022). Despite the fact that passion is not fixed and can develop on both continua, obsessive passion cannot transform into harmonious passion and vice versa (Vallerand et al., 2003; Vallerand & Rahimi, 2022). Obsessive passion is characterized by an uncontrollable urge to engage in the activity that one loves and cares about, where the activity is strongly associated with self-worth and social acceptance (Rip et al., 2008). Harmonious passion is characterized by a controllable desire to engage in the activity and is related to autonomy and positive experiences (Rip et al., 2008). In contrast with obsessive passion, harmonious passion is not associated with self-worth and social acceptance, but rather with a voluntary and flexible choice to engage in the activity (Rip et al., 2008).

While passion is essential for individuals to be motivated to pursue the high level of training necessary to succeed as a professional or amateur athlete, it has been suggested to have both short- and long-term influences on athletes' careers (Schiphof-Godart & Hettinga, 2017). Because obsessive athletes tend to prioritize short-term success, their decision-making can become inadequate and lead to injuries and burnout (Curran et al., 2015; Schiphof-Godart & Hettinga, 2017).

Early research regarding passion and its contribution to the chronicization of pain in dancers has yielded highly interesting results (Akehurst & Oliver, 2014; Rip et al., 2006). More specifically, two studies have investigated the influence of passion on pain, injuries, and health-related behaviours in dancers (Akehurst & Oliver, 2014; Rip et al., 2006). While harmonious passion has been associated with reduced recovery time following an injury, higher obsessive passion has been linked to ignoring pain, not stopping dance activities and not seeking adequate treatment following an injury in pre-professional contemporary dancers (Rip et al., 2006). Higher obsessive passion has also been associated with risky behaviours, such as ignoring recommendations from health professionals and avoiding medical consultations following injuries in modern, jazz, hip hop and ballet dancers (Akehurst & Oliver, 2014). Results from both studies have shed light on how passion is associated with behaviour in dancers when they are in pain or injured. However, more research is needed to understand the relationship between passion and the incidence of MDEs in dancers.

Performance anxiety can occur when there is a discrepancy between the athlete's or the artist's perception of their own abilities and what is expected of them (Walker & Nordin-Bates, 2010). A certain level of somatic performance anxiety, such as shortness of breath or the feeling of "butterflies", could be deemed beneficial, but higher levels of performance anxiety may be detrimental (Walker & Nordin-Bates, 2010).

Among athletes participating in various sports, researchers have suggested that performance anxiety is an important factor in the outcome of sports events (Palazzolo, 2020). It was also found that, especially in young female athletes, performance anxiety is very common (Patel et al., 2010). Dancers are particularly susceptible to performance anxiety (Walker & Nordin-Bates, 2010). It has been observed that anxiety can be crippling for musicians and other performing artists, preventing them from performing at their normal level (Powell, 2004). The association between performance anxiety and injuries has been investigated in musicians (Baadjou et al., 2016; D. Kenny & Ackermann, 2013). A systematic review presented one case-control study and two cross-sectional studies, where a higher level of performance anxiety was associated with a higher incidence and recurrence of playing-related musculoskeletal disorders in musicians (D. Kenny & Ackermann,

2013; Steinmetz et al., 2015; Zaza & Farewell, 1997). More longitudinal studies are needed to understand this relationship in dancers.

The aim of this study was to examine the relationships between obsessive and harmonious passion as well as performance anxiety and the incidence of MDEs throughout a 38-week dance season. It was hypothesized that higher obsessive passion and performance anxiety would be associated with a higher incidence of MDEs, and that harmonious passion would not be related to the incidence of MDEs.

## 2. Methods

### 2.1. Participants

Recruitment was carried out in 14 dance schools and companies, where the study was presented to their dancers. Dancers interested in participating were invited to provide their contact information to the PhD student in charge of the study, to schedule appointments for the initial assessment. A total of 118 dancers were enrolled in the study in which they were evaluated at the beginning of the season and asked to complete the 38-week follow-up.

Dancers were included in the study if they: (1) were aged 16 and over; (2) were fluent in English or French; (3) were a contemporary or ballet dancer; (4) were enrolled in a pre-professional program or employed by a professional dance company; and (5) reported dancing at least 10 h per week. The 10-hour-a-week cut-off was established to ensure a minimum level of dance exposure (Fuller et al., 2019). Dancers were excluded from the study if they had a musculoskeletal disorder that completely prevented them from dancing at the initial assessment or if they were pregnant. These exclusion criteria were selected because both these conditions can have a substantial impact on lumbopelvic musculature, which was evaluated in the physical portion of a larger study.

The sample size was calculated based on the association between physical factors presented elsewhere (Benoit-Piau et al., 2024), as well as psychological factors and the incidence of MDEs. In order to detect moderate correlations ( $r \geq 0.30$ ) with a significance level of 0.05 and 80% power, 85 participants were required. To account for a potential dropout rate of 15% during the season, 118 participants needed to be recruited.

Of the 118 dancers enrolled, 10 (8.5%) dropped out of the study during the season due to lack of time ( $n = 7$ ) or because they quit their dance school or company ( $n = 3$ ). At the end of the season, after reviewing all weekly diaries, twenty dancers did not meet the criterion of at least 10 h of dance per week and were excluded from the analysis given the possible impact of dance exposure on MDEs. Therefore, eighty-eight dancers were included in the final analysis.

Participants had a mean age of  $20.7 \pm 4.2$  years and a mean BMI of  $21.1 \pm 2.6$ . Sixty-seven dancers identified as female, 20 as male and 1 declined to answer. Thirty-eight participants were ballet dancers and 50 were contemporary dancers. They danced  $20.2 \pm 7.9$  h per week on average. Sixteen were professional dancers, and 72 were pre-professional dancers.

### 2.2. Study design

This multicenter prospective cohort study was completed over a nine-month dance season. This design was selected to enable the appraisal of the association between psychological factors and MDE incidence during the dance season. Dancers participated in a single assessment session to evaluate psychological factors at the beginning of the season and were followed through electronic diaries in a longitudinal design for the remainder of the 38-week-long season to record MDEs. This study was approved by the institutional review boards of CIUSSS de l'Estrie – CHUS and Cégep Saint-Laurent. Dancers provided written and informed consent prior to their assessment.

### 2.3. Measures

The assessment of dancers was conducted at the beginning of the dance season for the three independent variables: obsessive and harmonious passion, as well as performance anxiety. During the initial assessment, dancers also had to complete a demographic questionnaire, including information regarding injuries sustained in the past year.

Obsessive and harmonious passion were evaluated using the Passion Scale (Vallerand et al., 2003). An exploratory and subsequently a confirmatory factor analysis supported the use of a dualistic model of passion, consisting of obsessive and harmonious types (Vallerand et al., 2003). Since the initial study on passion, more than 20 other studies have conducted exploratory/confirmatory factor analysis and provide support for the validity of the Passion Scale (Vallerand & Rahimi, 2022). In addition, research also provides support for the scale invariance as a function of gender, age, types of activities (Marsh et al., 2013), and types of sports participants (Schellenberg et al., 2014; Vallerand & Verner-Filion, 2020). Both subscales have displayed high levels of reliability (Vallerand et al., 2003; Vallerand & Rahimi, 2022). The obsessive and harmonious passion subscales each comprised six questions. In addition to these two subscales, a criterion subscale containing five questions was used to measure if participants were passionate about the activity. In line with past research (Vallerand & Rahimi, 2022), this subscale was not used for analysis as such, but only to ensure that all participants were passionate about dance. It was found that 100% of dancers obtained a mean score of 4 and above on this subscale and thus were passionate about dancing. All questions are measured using a 7-point Likert scale ranging from 1 to 7, with 1 being “Do not agree at all” and 7 being “Strongly agree”. In the current study, internal consistency (Conbrach’s alpha) was 0.793, 0.741 and 0.745 for the obsessive and harmonious passion subscales, as well as the passion criterion subscale, respectively.

Performance anxiety was evaluated using the Kenny Music Performance Anxiety Inventory Revised (K-MPAI(R)) (Chang-Arana et al., 2018; Kantor-Martynuska & Kenny, 2018). This tool is composed of 40 items, which are evaluated on a 7-point Likert scale that ranges from “strongly disagree” to “strongly agree”. These 40 items are divided into eight subscales: (1) proximal somatic anxiety and worry about performance (11 items), (2) worry/dread focused on self/other scrutiny (8 items), (3) depression/hopelessness (8 items), (4) parental empathy (4 items), (5) generational transmission of anxiety (3 items), (6) anxious apprehension (3 items), (7) biological vulnerability (1 item), and (8) memory (2 items). Since the memory subscale was not adapted for use in dancers (i.e., “when performing without a music sheet, my memory is reliable”), the two items of this subscale were not used in the present study. An exploratory factor analysis confirmed the use of a unidimensional interpretation of performance anxiety, as well as first-level order interpretations for the subscales (Chang-Arana et al., 2018). The score of the K-MPAI(R) can therefore be used as one total score or multiple scores, one for each subscale. Cronbach’s alpha was 0.919 for the 38 included items of the performance anxiety scale in this study. The internal consistency was computed for 6 of the subscales. The memory subscale was excluded because it did not apply to dancers and the biological vulnerability subscale was excluded from the internal consistency analysis because it only comprises 1 item. The internal consistency for the 6 subscales ranged from poor to acceptable: proximal somatic anxiety and worry about performance (0.811), worry or dread focused on self/other scrutiny (0.781), depression/hopelessness (0.723), parental empathy (0.620), generational transmission of anxiety (0.644), and anxious apprehension (0.375).

The dependent variables, that is, the number of MDEs causing pain, modification or interruption of dance, were monitored through 38 weekly electronic diaries during the season. The median number of weekly diaries completed was 32.5 out of 38 (interquartile range 16–38). Dancers had to complete the Self-Estimated Functional Inability Because of Pain Questionnaire (SEFIP) and the Injury Occurrence Report

in this diary (Bronner et al., 2006; Ramel & Moritz, 1994). The dancers rated every body part for pain on the SEFIP scale to determine if they were: (0) very well, (1) had some pain but not much of a problem, (2) quite a bit of pain but can handle it, (3) a lot of pain and must avoid some movements, or (4) cannot dance because of pain. The incidence of one MDE was recorded when the dancer indicated 2, 3 or 4 for a body part for one or multiple weeks. If the same body part was rated as painful for multiple weeks, only one episode of MDE was recorded. If the pain resolved, i.e., the dancer indicated 0 for that body part for at least four weeks, it was then considered as two separate MDEs (Stanton et al., 2011). MDEs were categorized using three levels of severity: MDE causing pain only, MDE causing modification or MDE causing interruption of dance. Dancers were also instructed to record the number of hours danced each week in the diary.

### 2.4. Statistical analysis

SPSS 28.0 (Statistical Package for the Social Sciences, IBM) was used to conduct all statistical analyses. Descriptive analyses were used to characterize the sample. Simple linear regressions were used to determine if there was an association between the psychological variables ((1) obsessive passion, (2) harmonious passion, and (3) performance anxiety and its subscales) and the dependent variables ((1) MDE with pain, (2) modification or (3) interruption). Each linear regression included the following control variables: number of dance hours reported during the season, primary dance style (ballet or contemporary), number of injuries in the previous season, and level (being a professional or pre-professional dancer). These control variables were chosen because they have previously been related to the incidence of injuries in dancers (Caine et al., 2016; Ekegren et al., 2014; Yau et al., 2017). This multiple regression model was completed with both obsessive and harmonious passion as done in past research when the two types of passion are related (Lafrenière et al., 2008). For all regressions, statistical assumptions were met, namely normality, linearity, homoscedasticity and independence of residuals. The level of significance was set at  $p \leq 0.05$ .

## 3. Results

### 3.1. Descriptive data

Table 1 presents the descriptive data for all variables. The total MDEs refers to the mean number of MDEs that occurred throughout the season per dancer. Dancers reported an average of  $14.2 \pm 15.1$  MDEs, where  $5.3 \pm 7.7$  MDEs caused modification of training and  $1.0 \pm 2.2$  MDEs caused interruption of training per 1000 h of dance (Liederbach et al., 2012). A correlation matrix between all variables is presented in Appendix 1. Moderate correlations were found between (1) obsessive and harmonious passion ( $r = 0.317, p = 0.004$ ) and (2) obsessive passion and performance anxiety ( $r = 0.368, p = 0.001$ ). A significant correlation was found between obsessive passion and MDEs with interruption of dance ( $r = 0.249, p = 0.026$ ).

Table 2 reports the results of the linear regression analyses. It can be seen that harmonious passion was not significantly associated with the number of MDEs causing pain, modification or interruption of dance,

**Table 1**  
Descriptive data.

	Mean	SD
1. Harmonious passion (/7)	5.10	0.62
2. Obsessive passion (/7)	3.23	1.17
3. Performance anxiety (/228)	85.95	31.04
4. Total MDEs	5.3	4.2
5. Total MDEs with modification of dance	1.9	2.5
6. Total MDEs with interruption of dance	0.5	0.8

MDEs: musculoskeletal disorder episodes

**Table 2**  
Individual linear regressions.

MDEs causing pain as dependent variable				
Independent variables	Adjusted R <sup>2</sup>	Standardized β	95% C.I.	p
Harmonious passion	0.122	-0.139	[-0.340, 0.076]	0.210
Obsessive passion	0.115	0.082	[-0.071, 0.153]	0.467
Performance anxiety	0.144	0.047	[-0.023, 0.035]	0.668
Proximal somatic anxiety and worry	0.159	0.086	[-0.048, 0.113]	0.426
Worry/dread focused on self/other scrutiny	0.129	0.047	[-0.073, 0.116]	0.656
Depression/hopelessness	0.127	-0.030	[-0.140, 0.105]	0.772
Parental empathy	0.134	0.080	[-0.122, 0.267]	0.461
Generational transmission of anxiety	0.131	0.056	[-0.143, 0.244]	0.603
Anxious apprehension	0.135	-0.084	[-0.399, 0.167]	0.417
Biological vulnerability	0.129	-0.032	[-0.541, 0.394]	0.756
MDEs causing modification as dependent variable				
Independent variables	Adjusted R <sup>2</sup>	Standardized β	95% C.I.	p
Harmonious passion	0.071	-0.066	[-0.168, 0.092]	0.561
Obsessive passion	0.075	0.023	[-0.063, 0.077]	0.843
Performance anxiety	0.093	0.046	[-0.014, 0.021]	0.683
Proximal somatic anxiety and worry	0.119	0.150	[-0.015, 0.083]	0.176
Worry/dread focused on self/other scrutiny	0.079	0.020	[-0.053, 0.064]	0.855
Depression/hopelessness	0.081	0.008	[-0.072, 0.078]	0.940
Parental empathy	0.081	0.009	[-0.115, 0.125]	0.935
Generational transmission of anxiety	0.082	0.012	[-0.113, 0.125]	0.916
Anxious apprehension	0.099	-0.131	[-0.281, 0.065]	0.219
Biological vulnerability	0.096	-0.119	[-0.447, 0.123]	0.261
MDEs causing interruption as dependent variable				
Independent variables	Adjusted R <sup>2</sup>	Standardized β	95% C.I.	p
Harmonious passion	0.034	0.060	[-0.034, 0.058]	0.603
Obsessive passion	0.095	0.264	[0.004, 0.052]	0.022
Performance anxiety	0.065	0.042	[-0.005, 0.008]	0.709
Proximal somatic anxiety and worry	0.063	0.088	[-0.011, 0.025]	0.440
Worry/dread focused on self/other scrutiny	0.057	0.106	[-0.011, 0.030]	0.338
Depression/hopelessness	0.035	-0.067	[-0.035, 0.019]	0.546
Parental empathy	0.032	-0.063	[-0.054, 0.031]	0.583
Generational transmission of anxiety	0.029	-0.033	[-0.049, 0.036]	0.772
Anxious apprehension	0.047	0.134	[-0.024, 0.100]	0.222
Biological vulnerability	0.029	-0.015	[-0.110, 0.095]	0.889

MDE: musculoskeletal disorder episodes

and neither was performance anxiety or any of its subscales. When controlling for confounding variables, obsessive passion was found to be significantly and positively associated with MDEs requiring interruption of dance (Standardized β = 0.264, p = 0.022). Moreover, the regression model could significantly explain 9.5% of the variance of MDEs causing interruption of dance (F = 2.613, p = 0.032).

Table 3 shows the results of a multiple hierarchical regression conducted for MDEs causing interruption of dance. Control variables were introduced in the first step, harmonious passion in the second step, and obsessive passion in the third step. Obsessive passion explained an additional 5.3% of the variance of MDEs causing interruption of dance above control variables and harmonious passion. Because harmonious passion was not associated with the dependent variable, the model was only borderline significant (F = 2.163, p = 0.057). Although this model was not significant, it shows that obsessive passion remains significant when including harmonious passion in the regression.

#### 4. Discussion

The aim of this prospective study was to examine the association between obsessive and harmonious passion, as well as performance anxiety and the incidence of MDEs throughout a dance season. It was found that obsessive passion was associated with a higher incidence of MDEs causing interruption of dance. No other associations were found between harmonious passion, performance anxiety and the incidence of MDEs.

The hypothesis regarding the relationship between obsessive passion and the incidence of MDEs was confirmed using linear regressions. Indeed, when including control variables, a greater level of obsessive passion was positively and significantly associated with a higher number of MDEs causing interruption of dance. It should, however, be noted that this correlation was weak. No significant associations were found between obsessive passion and the number of MDEs causing pain or modification of dancing. These findings are in line with past research. Indeed, in a study investigating passion and injuries, it was found that dancers sustaining chronic injuries were less likely to take time off dance to promote healing (Rip et al., 2006). Dancers with higher obsessive passion tend not to follow recommendations, avoid consulting health care professionals and ignore injury-related pain (Akehurst & Oliver, 2014; Rip et al., 2006), which could explain why they have a higher number of serious injuries, i.e. a higher number of MDEs causing interruption of dance activities. Similar results were found in athletes, where those with higher obsessive passion were less likely to report sustained concussions (Martin et al., 2023). In a study on runners, it was found that runners who had higher obsessive passion were 1.36 times more likely to develop injuries (Mousavi et al., 2021). The relationship between obsessive passion and MDEs causing interruption of dance was also significant when accounting for harmonious passion.

In line with our initial hypothesis, harmonious passion was not significantly associated with the incidence of MDEs causing pain, modification or interruption of dance. According to a study by Rip et al., stopping dance to promote healing was associated with a higher degree of harmonious passion and shorter recovery times from dance-related injuries (Rip et al., 2006). In another study, harmonious passion was not associated with risky behaviours, as was obsessive passion (Akehurst & Oliver, 2014). Therefore, dancers who exhibit a higher level of harmonious passion are less likely to engage in risky behaviours, which could explain why higher harmonious passion was not correlated with a

**Table 3**  
Multiple hierarchical regression with MDEs causing interruption.

	Adjusted R <sup>2</sup>	Standardized β	95% C.I.	p
Control variables	0.040			0.281
Harmonious passion	0.031	-0.008	[-0.049, 0.046]	0.946
Obsessive passion	0.084	0.268	[0.003, 0.054]	0.027



higher incidence of MDEs. In athletes practicing an endurance sport, harmonious passion has been deemed crucial to attain a high level of performance, but was not associated positively or negatively with injury incidence (Schiphof-Godart & Hettinga, 2017).

With respect to performance anxiety, the present results did not support our initial hypothesis. Indeed, no significant associations were found between performance anxiety or its subscales and the number of MDEs causing pain, modification or interruption of dance. These findings are contrary to past research on musicians. In contrast, one cohort study and two cross-sectional studies found an association between performance anxiety and injuries (Baadjou et al., 2016; D. Kenny & Ackermann, 2013; Steinmetz et al., 2015; Zaza & Farewell, 1997). The discrepancy between the results in the present study and the existing literature on performing artists could be explained by differences in the design of the studies, as well as between musicians and dancers. Indeed, performance anxiety could appear following an injury but not contribute to its incidence. This would explain why this association was observed in cross-sectional studies but not in the current prospective study (D. Kenny & Ackermann, 2013; Steinmetz et al., 2015). It should also be noted that while univariate analysis yielded a significant association between performance anxiety and recurrent MDEs in the cohort study, this association was not significant when accounting for control variables in multivariate analysis (Zaza & Farewell, 1997). Although musicians and dancers share a strong vocational motivation as performing artists, there are notable differences between the two, with musicians playing musical instruments, while dancers primarily use their bodies as instruments (Guptill, 2012). In university athletes of various sports, competition anxiety was more prevalent in individual than team sports (Kemarar et al., 2022). In a recent systematic review, authors highlighted that athletes participating in both individual and team competitive sports were at risk of performance anxiety and that it could influence their performance (Reardon et al., 2024). However, performance anxiety was not associated with the incidence of injuries (Reardon et al., 2024).

Some limitations should be acknowledged when interpreting the results of the present study. Firstly, MDEs were self-reported only and were not confirmed by health care professionals. Also, the dancers reported pain, as well as injuries (pain causing modification or interruption of dance activities). While this could be seen as a limitation, it is highly representative of the reality of a dancer. Indeed, dancers will often self-diagnose and self-treat (Lai et al., 2008; Lim et al., 2018; Sabo, 2013). Because they evolve in a highly competitive environment where pain is still taboo, dancers will tend to avoid reporting injuries to ballet masters or health care professionals (Lai et al., 2008; Lim et al., 2018; Sabo, 2013). Thus, self-reporting using a validated questionnaire appears to be the most appropriate method of quantifying MDEs. Secondly, passion and performance anxiety were measured at the beginning of the season only and were not monitored throughout the season.

Future research should address the underlying mechanisms to enhance our understanding of how psychological variables can affect the incidence of MDEs in dancers, performing artists such as musicians and circus artists, as well as other athletes. Studies should use prospective longitudinal designs to monitor the changes in psychological variables, such as passion and performance anxiety, throughout the season and how they affect injuries. Moreover, further studies should investigate the potential moderating and mediating effects of psychological variables on the relationship between physical risk factors, reporting of injuries and other social variables contributing to the incidence of MDEs in dancers and athletes.

## 5. Conclusions

This study expands on the existing literature regarding the influence of psychological factors on MDE incidence in dancers. While a significant association was found between a higher level of obsessive passion and MDE incidence, the correlation was mild and the exact mechanisms

underlying this relationship remain to be explored. Higher harmonious passion was not associated with a higher incidence of MDEs when controlling for confounding factors, as expected. The same was observed for performance anxiety and its subscales. Considering that obsessive passion was associated with a higher incidence of MDEs causing an interruption of dance, treatments for dancers should take this specific variable into account to better manage their injuries.

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## CRedit authorship contribution statement

**Justine Benoit-Piau:** Writing – review & editing, Writing – original draft, Resources, Project administration, Methodology, Investigation, Funding acquisition, Formal analysis, Data curation, Conceptualization. **Nathaly Gaudreault:** Writing – review & editing, Supervision, Resources, Methodology, Funding acquisition, Conceptualization. **Robert Vallerand:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Sylvie Fortin:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Christine Guptill:** Writing – review & editing, Supervision, Methodology, Conceptualization. **Mélanie Morin:** Writing – review & editing, Supervision, Resources, Methodology, Conceptualization.

## Declaration of competing interest

None.

## Data availability

Data will be made available on request.

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## Abbreviations

MDEs Musculoskeletal disorder episodes  
K-MPAI(R) Kenny Music Performance Anxiety Inventory Revised

## Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.psychsport.2024.102632>.

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