



## Original Research

## Running status and history: A self-report study

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## ABSTRACT

**Objectives:** The purpose of the current study was to compare injury and running history among current and former runners who consider themselves either injured or uninjured.

**Design:** Cross-sectional survey.

**Setting:** Online survey, available to any individuals over the age of 18 who currently run (runners) or who once ran regularly but are no longer running (former runners).

**Participants:** 312 participants (age  $38 \pm 12$  years, 219 males, 89 females, 4 did not disclose) completed the survey.

**Main outcome measures:** This study assessed injury incidence, consequences of injury such as time off, and reported injury diagnoses and treatments. Chi-square and frequency analyses were calculated to describe running status, injury counts, and response to injury.

**Results:** Most participants (80%) reported 1 + running injury. 775 total injuries were reported. The four most common injuries were iliotibial band syndrome (34%), plantar fasciitis (30%), strained thigh/hip muscle (25%), and medial tibial stress syndrome (22%). About 40% of participants continued to run with these injuries.

**Conclusions:** Injury frequencies (80%) agreed with those reported in the literature. The results of this study also support the notion that running injuries exist on a continuum of severity and that the individual response to injury is complex and determined by various factors.

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## 1. Introduction

Running is a popular and convenient form of physical activity with many known benefits, including improved cardiovascular health and reduced risk of all-cause morbidity. Despite these benefits, running is associated with high injury rates (Fields, Sykes, Walker, & Jackson, 2010; Lee et al., 2017; van der Worp et al., 2015; Van Gent et al., 2007). Research has identified incidence rates of 11%–85% and 2.5 to 38 injuries per 1000 h of running (Nielsen, Buist, Sørensen, Lind, & Rasmussen, 2012; van der Worp et al., 2015; Van Gent et al., 2007; Videbæk, Bueno, Nielsen, & Rasmussen, 2015). Though many risk factors have been proposed with contradictory support in the literature, a history of previous injury is a largely supported risk factor for injury (Rasmussen, Nielsen, Juul, & Rasmussen, 2013; Saragiotto et al., 2014; van der

Worp et al., 2015; Van Gent et al., 2007; Van Mechelen et al., 1996). Considering this risk factor, runners who have sustained injuries but continue running may be at an increased risk of future injury. However, the response to running injury varies between individuals. Limited research has demonstrated that runners frequently cite injury as a reason for pausing or stopping running (Gosling, Gabbe, & Forbes, 2008; Koplan, Rothenberg, & Jones, 1995), though it has also been reported that many runners continue training while injured (Jaeschke, Sachs, & Dieffenbach, 2016; Russell & Wiese-Bjornstal, 2015; Wiese-Bjornstal, 2010). Without additional research to determine how injury may influence an individual's running status, it is difficult to examine the relationship between injury history, running status and injury risk.

The majority of running injuries (80%) are considered overuse injuries, with symptoms that develop gradually over time (Lopes, Hespanhol, Yeung, & Pena Costa, 2012; Russell & Wiese-Bjornstal, 2015; van der Worp et al., 2015). As overuse running injuries are subtle in their onset, athletes may not be aware of the significance of their injury and continue to run despite pain (Russell & Wiese-Bjornstal, 2015; Shuer & Dietrich, 1997). Individuals who

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continue running while injured may self-diagnose and treat their injuries without visiting a healthcare professional (Jacobs & Berson, 1986; Russell & Wiese-Bjornstal, 2015). This lack of formal treatment may lengthen the injury duration and promote the development of compensatory mechanics. However, even with treatment, subtle pathological movement patterns may develop after injury. Altered running mechanics have been linked to injury and increased stress on other joints (Dierks, Manal, Hamill, & Davis, 2011; Fulton et al., 2014), which may increase the incidence of future injury. Thus, frequently-injured runners are more likely to experience altered mechanics and may decrease their training or permanently stop running in response to the development of running injuries.

However, while injury may cause some runners to alter their training, many individuals continue running while injured (Jaeschke et al., 2016; Russell & Wiese-Bjornstal, 2015). This inclination to run through an injury may be due in part to various factors, such as maintenance of physical fitness, weight management, or reaching a goal. In ultra marathon runners, perceived mental toughness, or the ability to overcome or ignore pain to achieve a performance goal, may result in runners continuing their training even while injured (Jaeschke et al., 2016; Russell & Wiese-Bjornstal, 2015). Moreover, some individuals may continue to run while injured due to time and resource investment, and may attempt self-diagnosis and self-treatment to avoid interrupting their training (Jacobs & Berson, 1986; Russell & Wiese-Bjornstal, 2015). However, while some individuals are reluctant to alter their running routine, others may pause training, take a longer break than expected, or never begin running again after an injury. While a departure from running is sometimes due to injury, other times it is due to lifestyle or livelihood changes (Koplan et al., 1995). Participation in running may fluctuate as a response to aging or various phases of life, such as the birth of a child or changing interests (Koplan et al., 1995). Research examining why individuals may stop running is limited, therefore, it is not known how various life events, including injury, might influence running status. While there are many factors which may contribute to an individual choosing to alter their training either temporarily or permanently, there are few research studies that examine these factors, particularly in a larger set of participants. Additionally, there is a paucity of research to examine the effect of injury history and different types of injury on current running status.

Therefore, the purpose of the current study was to compare injury and running history among current and former runners who consider themselves either injured or uninjured. Participants reported if they were either running regularly or not running regularly and if they were injured or uninjured, at the time of survey completion. Based on these two questions, participants were sorted into one of four groups, consisting of individuals who were, at the time of survey completion: 1) uninjured and running; 2) injured, yet still running; 3) uninjured and not running; and 4) injured and not running. Participants also reported the types and locations of injuries they had sustained while running, and how those injuries influenced their training. We aimed to determine not only how different injuries influenced training, but also if current running status and injury status, as determined by group inclusion, was related to the type and number of injuries that an individual had experienced. We hypothesized that injury frequencies and the responses to injury would differ among the four groups, with some individuals continuing to run while injured, and others stopping for various amounts of time. Specifically, when asking about injury history, we expected that injured and uninjured participants who were currently running would report that they ran while injured more often, while those in the former running groups would report more instances of altering training due to injury. Additionally, we

expected that current runners would have a history of fewer injuries than those who were not running at the time of survey completion. Injuries were further categorized based on their occurrence and reoccurrence, and we expected that group and injury occurrence would be related. Specifically, we hypothesized that recurrent and chronic injuries would be more common in former runners. The overarching goal of this study was to better understand the types of injuries that runners experience and the individual response to running injuries.

## 2. Methods

### 2.1. Participants

The research survey, deemed an exempt study by the University's Institutional Review Board, was advertised to current and former runners via word of mouth, social media, and flyers. The target population included individuals who run regularly (current runners) and individuals who previously ran regularly but were not running at the time of survey completion (former runners). Participants were further grouped based on their injury status. Exclusion criteria included individuals who had never run regularly and individuals under the age of 18. A power analysis was conducted based on chi-square goodness of fit tests with 3 degrees of freedom, and it was determined that 22 participants per group were needed ( $\alpha = 0.017$ ,  $\beta = 0.2$ ,  $w = 0.8$ ). Overall, 319 participants began the survey, and 318 completed the survey. Of those, seven participants indicated they had never run regularly, thus not meeting inclusion criteria, and were directed to the end of the survey. Consequently, the total number of participants was 312.

### 2.2. Survey development

The study was developed using Qualtrics software (version 12.17, Provo Utah, US) and consisted of questions regarding running status and history, injury status and history, and training habits. A panel of five experts in related fields of study, including biomechanics, physiology, sports medicine, and community health, first analyzed the survey to establish face and content validity. It was then pilot tested among 15 Division-1 cross-country athletes. The athletes in this group had extensive injury histories, which were known to researchers, allowing for the determination of question validity. Following edits based on pilot data, the survey was available from December 2017 through April 2018. The survey consisted of questions related to current running and injury status, previous injury history, and responses to injury occurrence. The survey has been provided (Appendix) and is described in the following sections.

### 2.3. Establishing running status

The first question assessed current running status. Participants were asked if they were running regularly or had ever considered themselves a regular runner. They were presented with three options: 1) currently running, 2) had run regularly at some point but were not running now, or 3) had never run regularly before. Participants who responded that they were running regularly were considered current runners and were presented with follow-up questions regarding their training, including mileage and upcoming events. Participants who responded that they were no longer running were considered former runners and were not presented with questions regarding training. Participants who indicated that they had never run were directed to the end of the survey, as they did not meet the inclusion criteria.

#### 2.4. Establishing injury status

Next, current and former runners were asked if they were injured at the time of survey completion or if they had been injured in the past four weeks. This question described injury as “pain that caused you to stop or alter running, with or without a medical diagnosis.” Participants who indicated that they had an injury in the past four weeks were considered part of the “currently injured” group. Participants who indicated that they had not experienced an injury in the past four weeks were considered part of the “uninjured” group. The responses to the questions regarding running status and injury status were later utilized to sort participants into the four groups of interest (injured runners, uninjured runners, injured former runners, uninjured former runners).

#### 2.5. Establishing injury history

Next, to establish injury history, all participants were asked if they had ever sustained a running injury during their running career. A follow-up question asked all participants if they had ever experienced pain or discomfort that was not serious enough to stop training or seek care, but led to altered training. This question allowed us to account for the individual variance in defining injury. Additionally, all participants were asked to report the body locations where they had experienced pain while running (i.e. left or right hip, knee, ankle). After determining the presence and location of pain, all participants were asked to indicate specific injuries they may have experienced. The list of injuries included 24 common running injuries compiled from various systematic reviews (Lopes et al., 2012; Taunton et al., 2002; Van Gent et al., 2007), as well as an “Other” option that allowed participants to enter an injury that was not listed (see Appendix). For each injury selected, four follow-up questions were presented. As these questions were presented for each injury reported, participants who selected multiple injuries were able to provide specific information regarding each of the indicated injuries. The first follow-up question determined the occurrence of injury and presented three options, which were defined for the purpose of this study as: 1) chronic, defined as an injury that consistently causes pain unless the participant stops running; 2) recurring, defined as an injury that has occurred more than once but does not consistently cause pain; and 3) single, which occurs acutely with no recurrence. These options were presented to determine how often the injury occurred, and how that occurrence influenced training. The next follow-up question determined the effect of injury by asking participants if the injury caused them to stop running, and if so, for how long. The final two questions asked participants if they sought medical care for the injury and what treatments were utilized. From this information, we were able to determine the types of injuries that occurred, how often they occurred or reoccurred, how they influenced training, and how participants treated the injuries.

#### 2.6. Data analysis

Survey responses were exported from Qualtrics and analyzed in SPSS. Using the questions related to the list of injuries, counts were established for each participant. Responses were then sorted into occurrence type for each injury. From this information, we were able to determine the total number of single, recurrent, and chronic injuries that each participant experienced.

Participants were organized into the established groups: (1) uninjured runners; (2) injured runners; (3) uninjured former runners; or (4) injured former runners, based on their responses to the questions regarding running status and injury status (Fig. 1 and Appendix). Once the participants were grouped, responses from

the specific injury questions were utilized to determine how many of each type of injury (single, recurrent, and chronic) each participant experienced. To account for variance in the reported injury distributions, these rates of injury were further divided based on the number of each occurrence type of injury experienced (0, 1, 2–3, or 4+). For each of the four groups and each of the three types of injury, chi-square goodness of fit tests were conducted on the four categories of injury frequency. This resulted in 12 chi-square tests, (four groups and three types of injury), with each test including four categories of injury frequency (0, 1, 2–3, or 4+). The null hypotheses for these tests were that there was an equal distribution of injury frequency among the categories. For example, within the injured runner group for single bouts of injury, the null hypothesis would be supported if 25% of the group experienced 0 injuries, 25% experienced 1 injury, 25% experienced 2–3 injuries, and 25% experienced 4 or more injuries. Deviations from this null hypothesis would suggest that a group was more likely to experience a specific number of each type of injury. As the analysis was conducted on each of the three levels of injury occurrence, a Bonferroni-adjusted alpha level of 0.017 was set *a priori*.

### 3. Results

#### 3.1. Participant characteristics

The average participant age was  $38 \pm 12$  years, with a minimum age of 18 years and a maximum age of 71 years. The average time to complete the survey was 15 min. Participants consisted of 219 males (70%), 89 females (29%), and four participants who chose not to disclose sex. Additional participant characteristics are provided in Table 1.

In total, 239 of the 312 participants (77%) reported that they currently run, while 73 (23%) reported that they were not running at the time of survey completion. Additionally, 77 (25%) participants reported that they were injured or had been injured in the past four weeks, while 235 (75%) reported that they were not injured. When participants were asked if they had ever experienced an injury while running, 67 participants (22%) reported one injury, 182 (58%) reported multiple injuries, and 63 (20%) reported no injuries. Of the 63 participants who never sustained a running injury, 31 (49%) had experienced pain or discomfort while running, while 32 (51%) had not. The site with most prevalent reports of pain was the foot and ankle ( $n = 198$ , 63%), followed by the knee ( $n = 162$ , 52%), thigh, hip, or pelvis ( $n = 143$ , 46%), lower leg ( $n = 121$ , 39%), back or neck ( $n = 57$ , 18%), and upper body ( $n = 24$ , 8%).

#### 3.2. Injury history

After determining sites where they had experienced pain, participants were asked to report any specific injuries they had sustained while running. From the list of 24 injuries, 775 injuries were reported. Injury reports were then categorized into occurrence type. Out of 312 participants, 241 (77%) reported at least one single-occurrence injury, 179 (57%) reported at least one recurrent injury, and 53 (17%) reported at least one chronic injury. When comparing injury frequencies in runners ( $n = 239$ ) to former runners ( $n = 73$ ), runners sustained more single-occurrence injuries ( $n = 198$ , 83%) than former runners ( $n = 43$ , 59%). Similar percentages of recurrent injuries were reported in runners ( $n = 137$ , 57%) and former runners ( $n = 42$ , 58%). Former runners reported more chronic injuries ( $n = 17$ , 23%) than runners ( $n = 36$ , 15%).

The four most common injuries (Fig. 2) were iliotibial band syndrome ( $n = 106$ , 34%), plantar fasciitis ( $n = 93$ , 30%), strained thigh or hip muscle ( $n = 79$ , 25%) and medial tibial stress syndrome

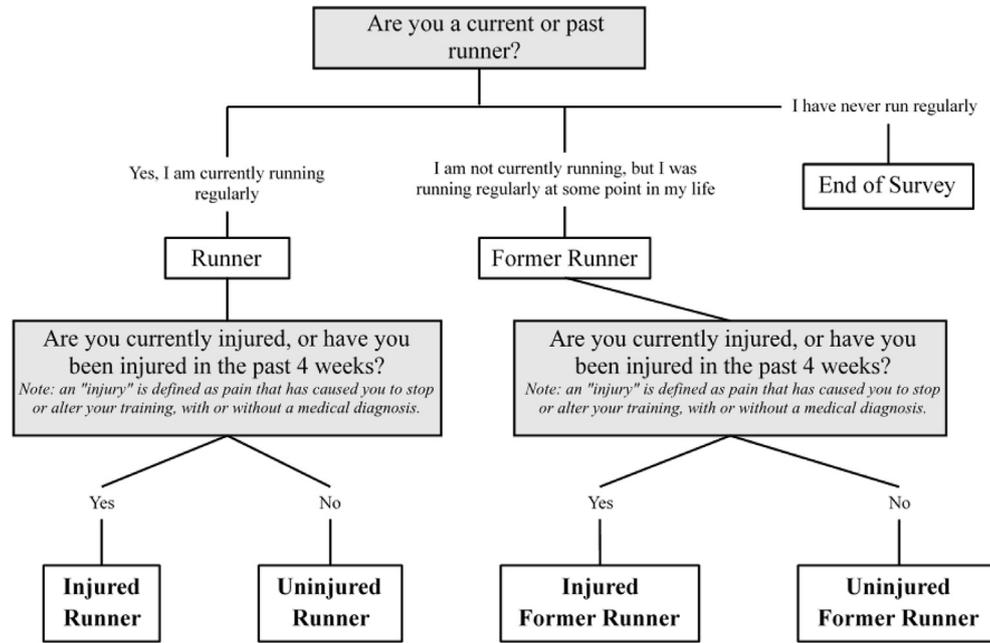


Fig. 1. A flowchart depicting the grouping of participants based on survey responses.

**Table 1**  
Other participant characteristics.

Weekly mileage	Frequency (%)
<10	39 (11.6)
10–19	85 (25.3)
20–29	67 (19.9)
30–39	23 (6.8)
40–49	11 (3.3)
>50	14 (4.2)
Time at current mileage	Frequency (%)
0–3 months	44 (13.1)
4–12 months	54 (16.1)
1–2 years	32 (9.5)
2–10 years	74 (22.0)
>10 years	35 (10.4)
Decade began running (years)	Frequency (%)
Before age 10	9 (2.7)
10–20	133 (39.6)
21–30	92 (27.4)
31–40	47 (14.0)
41–50	24 (7.1)
51–60	7 (2.2)

( $n = 70$ , 22%). Among these injuries, many participants reported that they continued to run while injured. Of the 106 participants who reported iliotibial band syndrome, 45 (42%) reported that they continued to run while injured. Of the 93 participants with plantar fasciitis, 37 (40%) continued to run while injured. Of the 79 participants with a strained thigh or hip muscle, 33 (42%) continued to run while injured. Of the 70 participants with medial tibial stress syndrome, 34 (49%) continued to run while injured. Fig. 2 depicts the injury frequencies and the effect of the injury on training. Participants were also asked if they sought medical care for each injury that they experienced. Among the top four injuries, 45% of participants with iliotibial band syndrome sought medical care, 51% of those with plantar fasciitis sought medical care, 35% of those with thigh/hip strains sought medical care, and 18% of those with medial tibial stress syndrome sought medical care.

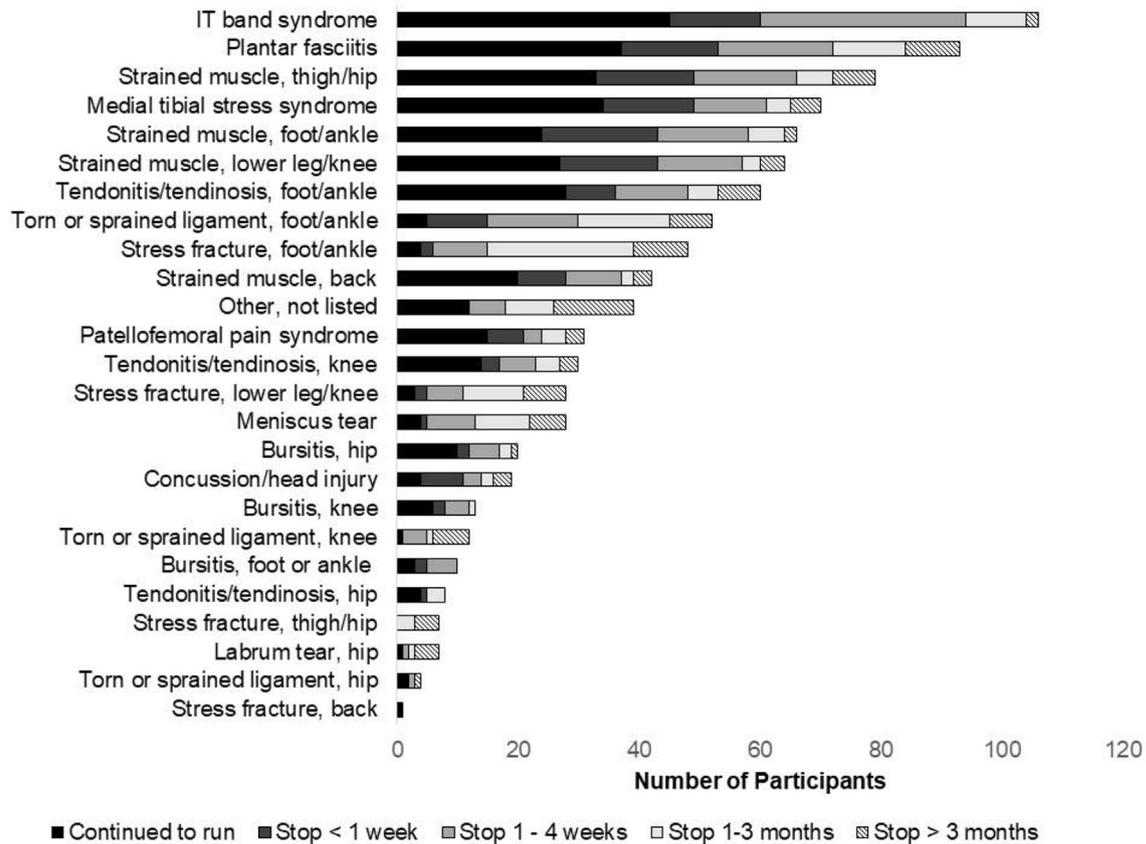
All participants were asked for reasons why they did not stop running or seek medical care if they had experienced pain or injury

while running. Of the 312 participants, 187 responded to this question, and were asked to select any reasons that applied. The most common response was that they did not think the injury was severe enough ( $n = 127$ , 68%). Additional responses included that the participant was able to treat the pain themselves ( $n = 95$ , 51%), altering training factors such as shoes, running surface, technique, or mileage decreased pain ( $n = 88$ , 47%), the injury did not cause pain all the time ( $n = 78$ , 42%), and the participant was training for an event and did not want to interrupt training ( $n = 72$ , 39%). Finally, all participants were asked if they had ever continued to run against medical advice, and 100 participants (33%) responded that they had, at some point, continued to run when a medical professional advised them to stop.

### 3.3. Distribution of injury occurrence by group

After analyzing participant demographics and injury history, a chi-square goodness of fit test was performed to determine if injury occurrence history was influenced by group. Participants were grouped according to running status and injury status at the time of survey completion into one of the four groups. Upon inspection of the collected data in regard to grouping, five responses were excluded from the group analyses. These responses were excluded as they initially indicated that they were not running, but later indicated they were still running. This discrepancy occurred when participants were asked if they would ever consider beginning to run again. The five excluded participants stated that they were still running, although they had previously indicated that they were not running. Due to potential group miscategorization, the responses were not included in the chi-square analysis. Therefore, 307 participants were included in the following group analysis. The four groups consisted of uninjured runners ( $n = 187$ , 60%), injured runners ( $n = 52$ , 17%), uninjured former runners ( $n = 45$ , 14%), and injured former runners ( $n = 23$ , 7%). Most of the former runners ( $n = 61$ , 89%) stated that they intend to begin running again.

The null hypotheses for the chi-square goodness of fit tests were that there was an equal distribution of injury frequency among the categories within each of the four groups of runners (uninjured



**Figure 2.** Depicts the reported occurrence of common running injuries. The x-axis represents the number of participants who reported experiencing each injury. The colored portions of each bar represent the effect of the injury on running status.

runners, injured runners, uninjured former runners, injured former runners). When the null hypothesis was rejected, further analysis of the data was conducted to determine how each group deviated from an equal distribution of the number of injury frequency. The results of the chi-square goodness of fit tests are described separately by group in the following paragraphs. Chi-square results are listed in Table 2 and group distributions are displayed in Fig. 3.

Among uninjured runners, the frequency of injury occurrence was not equally distributed for single ( $p < 0.001$ ), recurrent ( $p < 0.001$ ), and chronic injuries ( $p < 0.001$ ). Further analysis determined that uninjured runners ( $n = 187$ ) were more likely to experience one single-occurrence injury ( $n = 70, 37\%$ ), zero recurrent-occurrence injuries ( $n = 82, 44\%$ ), and zero chronic-occurrence injuries ( $n = 167, 89\%$ ).

Within the injured runners group, the frequency of injury occurrence was not equally distributed for single ( $p < 0.001$ ) and chronic ( $p < 0.001$ ) injuries, but frequencies of recurrent injuries were equally distributed ( $p = 0.037$ ). Injured runners ( $n = 52$ ) were

more likely to experience 2–3 single-occurrence injuries ( $n = 26, 50\%$ ) and zero chronic injuries ( $n = 20, 38\%$ ).

Among uninjured former runners, frequencies of single ( $p < 0.001$ ), recurrent ( $p = 0.007$ ), and chronic injuries ( $p < 0.001$ ) were not equally distributed. Uninjured former runners ( $n = 45$ ) were most likely to experience zero single injuries ( $n = 22, 49\%$ ), zero recurrent injuries ( $n = 20, 44\%$ ), and zero chronic injuries ( $n = 33, 73\%$ ).

The frequency of chronic injury occurrence within the injured former runner group was not equally distributed ( $p < 0.001$ ). Injured former runners ( $n = 23$ ) were most likely to experience zero chronic injuries ( $n = 18, 78\%$ ). This group demonstrated equal distributions of single ( $p = 0.051$ ) and recurrent ( $p = 0.405$ ) injuries.

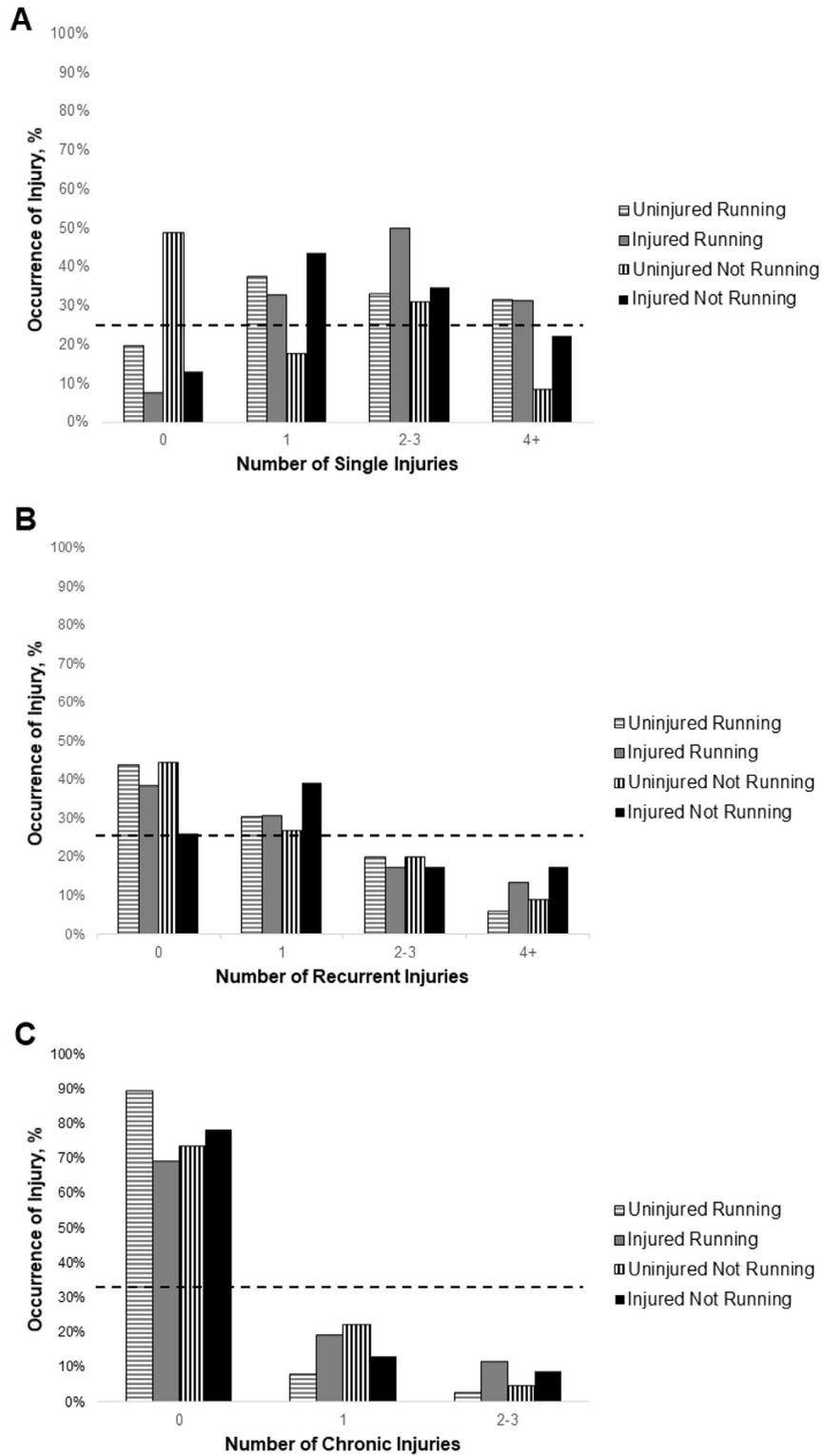
#### 4. Discussion

The purpose of this study was to compare injury history and running history among current and former runners, who, at the

**Table 2**  
Results of chi-square goodness-of-fit analysis.

	Single		Repetitive		Chronic	
	$\chi^2$	$p$	$\chi^2$	$p$	$\chi^2$	$p$
Uninjured Runners	36.25	<0.001*	58.20	<0.001*	264.43	<0.001*
Injured Runners	25.39	<0.001*	8.46	0.037	30.62	<0.001*
Uninjured Former Runners	21.22	<0.001*	11.98	0.007*	34.53	<0.001*
Injured Former Runners	7.78	0.051	2.91	0.405	20.96	<0.001*

Degrees of freedom = 3 for single and repetitive; 2 for chronic.  
\*indicates significance at 0.017 level.



**Fig. 3.** Depicts the frequency of single-occurrence (A), recurrent (B), and chronic (C) running injuries. The x-axis represents the number of injuries experienced by participants, and the y-axis represents the number of participants who reported experiencing each type of injury. Note: the dashed line represents an equal distribution of injury occurrence frequency (the null hypothesis of the chi-square tests).

time of survey completion, considered themselves either injured or uninjured. Participants reported their current running status, their injury history, along with instances of pain. Participants were first asked if they were currently running, and if they considered themselves injured. This led to four groups: uninjured runners,

injured runners, uninjured former runners, and injured former runners. Participants were asked to report injuries they had experienced while running, and the occurrence of each injury. We hypothesized that runners (injured and uninjured combined) would have fewer injuries overall than former runners. This hypothesis

was only partially supported. Runners were less likely than former runners to report chronic injuries (15% vs. 23%) and just as likely as former runners to report recurrent injuries (57% vs 58%). However, runners were more likely than former runners to experience single occurrence injuries (83% vs. 59%). Single occurrence injuries were the most common injury occurrence type in both injured and uninjured runners. Previous literature has determined that injury risk increases with exposure hours (Lopes et al., 2012; Van Mechelen et al., 1996). As the groups with higher frequencies of single-occurrence injuries are comprised of current runners, compared to former runners, it is possible that these frequencies are tied to exposure hours. Additionally, 36% of runners and 32% of former runners reported that they continued to run while injured. Running while injured may predispose individuals to additional or more severe injuries (Russell & Wiese-Bjornstal, 2015). High injury rates in running (Fields et al., 2010; Lee et al., 2017; van der Worp et al., 2015; Van Gent et al., 2007) indicate that many runners will become injured at some point. Single-occurrence injuries may heal quickly, and participants may adjust their training or technique to adapt and avoid a recurrent or chronic injury.

When former runners were split into groups based on injury status, we found that those who were injured were more likely to report a recurrent or chronic injury than those who were uninjured. This indicates that injured former runners may be taking time off training to heal recurrent or chronic injuries. In fact, when asked why they would or not begin running again, the three most common responses were that they were taking time to heal, their body needs a break, or they are afraid of becoming re-injured. In contrast, uninjured former runners were more likely to report taking breaks from running for non-injury reasons. All participants were asked if they had ever stopped running for more than three months for a reason that was not related to injury, and 67% of uninjured former runners said yes. This contrasts with uninjured runners (33%), injured runners (29%), and injured former runners (22%). Therefore, the uninjured former runners group may include individuals who stopped running for lifestyle purposes, thus reducing their exposure and injury risk. Indeed, agreeing with existing reports in the literature (Koplan et al., 1995), the birth of a child, finding a new preferred exercise routine, or time constraints were the primary reasons reported for uninjured former runners in this survey. Previous research in this area is limited, though it is important to consider reasons that individuals may stop running that are not related to injury occurrence.

Overall, a majority (80%) of participants reported at least one running injury during their running career. This injury frequency is expected based on reported injury rates in runners (Nielsen et al., 2012; Taunton et al., 2002; van der Worp et al., 2015; Van Gent et al., 2007). Interestingly, almost half (49%) of the participants who reported that they had never experienced an injury reported that they had felt pain or discomfort while running. Without further investigation, we cannot state that the pain was indicative of an ignored injury, but these results demonstrate that the individual interpretation of “pain versus injury” may vary. It is also possible that individuals are hesitant to identify as injured, due to fear or general distress associated with the development of injury (Russell & Wiese-Bjornstal, 2015; Wiese-Bjornstal, 2010).

The most commonly reported site of pain was the foot and ankle, followed by the knee. These results agree with other studies which report that running injuries are likely to occur at (Kluitenberg et al., 2015; Taunton et al., 2002; Van Gent et al., 2007) or below the knee (Lopes et al., 2012; Messier et al., 2018). The most common injuries were iliotibial band syndrome, plantar fasciitis, strained thigh or hip muscle, and medial tibial stress syndrome. Previous research has reported similar findings, though most also include patellofemoral pain syndrome as a common injury (Lopes

et al., 2012; Taunton et al., 2002). Patellofemoral pain syndrome was the 11th most common injury reported in this study. It is possible that providing a diagnostic term, rather than a description of the injury or a colloquial term such as “runner’s knee,” may have resulted in under-reporting (Lopes et al., 2012). Indeed, when examining responses in the “other” category, 11 individuals reported undiagnosed knee pain. It is possible that individuals would not consider knee pain as an injury, especially if they have not received a diagnosis such as patellofemoral pain syndrome.

Among the top four injuries reported, most participants continued to run while injured. Those participants were asked why, and most responded that they did not think the injury was severe enough to stop running. Other responses included being able to determine the cause of pain themselves, changing training habits, and feeling as though they did not want to interrupt training. These responses demonstrate that both the injury itself and the athlete’s characteristics may influence whether a runner will take time off while injured (Russell & Wiese-Bjornstal, 2015). We also discovered that among the most common injuries reported in this study, fewer than half of the participants sought medical care. These values are similar to another study, which reported that only 3 in 10 runners sought medical care for injuries (Russell & Wiese-Bjornstal, 2015). In addition, about one-third of our participants reported that they had continued to run against medical advice. We analyzed this response by group and found that roughly half of the injured runners and injured former runners continued to run against medical advice, compared to 30% of uninjured runners and 17% of uninjured former runners. This agrees with a previous study which assessed a runner’s likelihood to seek out medical care (Russell & Wiese-Bjornstal, 2015).

There are several limitations associated with the current study. Most of the limitations are related to survey-based research, including recall bias and volunteer bias. As we were asking participants to consider any running injury they had experienced, it is possible that inaccuracies exist. Furthermore, not all injuries were diagnosed by medical professionals, which may lead to over- or under-estimation of injury occurrence. However, a major aspect that was investigated by this study was the individual perception of pain and injury. While it may be more accurate to require a medical diagnosis for injuries, this information would not be representative of all pain or injuries experienced, as runners commonly avoid seeking medical care for injuries. This was true even in cases in which participants experienced pain that led to alterations in training or a complete cessation of activity. Additionally, it is important to consider the results of this study with the fact that the responses were collected at a single point in time, and a person’s perception of pain, or even running status, may change quickly. Finally, although the study consisted of over 300 responses, a majority of these responses were from uninjured runners, which may have influenced the statistical power of the analyses conducted. However, the information collected from these participants is extensive, and has provided promising information for future research questions.

Overall, injury frequencies in the current study were similar to those reported in the literature, with 249 of 312 participants (80%) reporting at least one running injury at some point in their running career. The individual response to injury is varied and appears to depend on many different factors. Our results highlight the difficulty in precisely defining injury in the literature, and contribute to the subjective narrative surrounding running injuries in current and former runners. We also found that some runners do not consider themselves injured even if they experience pain while running. The knee and below the knee were the most common sites of injury, which agrees with previous findings. When comparing groups of current and former runners, we found that runners are

more likely to experience single-occurrence injuries than former runners, but less likely to experience recurrent and chronic injuries. Additionally, about one-third of all participants reported that they had continued to run despite injury at least once. The results of the current study and the developed survey provide a rich source of information regarding the individual response to injury, and how that response may influence running status and overall injury research.

### Conflicts of interest

None reported.

### Ethical approval

This study was deemed exempt by the University's Institutional Review Board (protocol #1102083).

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None declared.

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None reported.

### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ptsp.2019.06.003>.

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