# EFFECTS OF CHRONIC LOWER EXTREMITY INJURY ON HEALTH RELATED QUALITY OF LIFE IN CURRENT AND FORMER DIVISION 1 TRACK AND FIELD ATHLETES

by

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## DEDICATION

I dedicate this research to my parents Jose and Noemy Penilla. I would never have made it this far without your sacrifices. You let me think I did this all by myself when in reality, you guys made sure I was never alone. I would be nothing without you two. First generation, second degree, I will always be proud that immigrants made me. Thank you.

I also dedicate it to my siblings; Danny, Brian and Jackie and my niece Cali Love and nephew Madden Cruz. Thank you for the craziness, thank you for the love.

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## LIST OF ABBREVIATIONS

| Abbreviation | Description |
|---|---|
| HRQoL | Health related quality of life |
| SF-36 | 36 Item-Short form survey |
| SF-36 PS | Short from 36 total physical score |
| SF-36 MS | Short from 36 total mental score |
| LEFS | Lower Extremity Functional Scale |
| D1 | Division one |
| T&F | Track and Field |
| TXST | Texas State University |
| I | Injured |
| NI | Non-injured |
| AT(s) | Athletic Trainer(s) |

# I: INTRODUCTION

Health related quality of life (HRQoL) is a multifaceted concept that has continued to evolve since the 1980s.[1,2] The Center for Disease Control (CDC) defines HRQoL as a concept that "encompasses those aspects of overall quality of life that can be clearly shown to affect health—either physical or mental."[1,3] The physical aspect of HRQoL is how one's physical functionality plays a role in their daily life, social activities and/or work setting. The mental aspect is one's mental state and how that plays a role in their everyday life, taking into account how anxious, nervous, or depressed one may feel in their daily life.[4-6] HRQoL has become a widely-accepted focus in public health research and clinical decision making for health care professionals.[7] A clinician, for example an athletic trainer (AT), cannot simply observe an athlete and know what their HRQoL is, this is an intricate concept that requires self-reporting from a patient. However, with HRQoL clearly being shown to affect health, ATs are responsible for maintaining athlete health and this includes both physical and mental aspects. Athletic trainers could utilize patients' HRQoL scores to improve their daily clinical decision making and to better treat their patients in a holistic manner.

People that are physically active have been shown to have a higher quality of life when compared to non-active individuals.[4,7-11] However, research has contradicting results when evaluating collegiate athletes. Previous studies have evaluated differences between current athletes and former athletes as well as current collegiate athletes and current general students.[7-11] Former collegiate athletes are more likely to have a lower HRQoL compared to former students that did not participate in collegiate athletics and current athletes are reporting lower HRQoL scores than current students who are

physically active.[8-10] Collegiate athletes can indisputably be described as physically active but are reporting lower scores during and after their athletic collegiate careers.[8-10,12] This current research area has not yet established a clear reason as to why collegiate athletes report lower HRQoL, although several studies have suggested injuries may have a negative effect on HRQoL during and after their competitive careers.[4,8,10,12,13] Given that athletes are more prone to experience multiple injuries compared to non-physically active individuals, the impact of injuries on the HRQoL needs further investigation.[8,10,15]

The Competitive Nature of Physical Activity. Athletic participation in the United States often begins in adolescence.[16,17] However the competitive nature of sport naturally increases with age during high school and again in the collegiate setting due to factors such as scholarships, awards, television broadcasts, among others.[18] The most recognized and regulated athletes in the collegiate setting are those participating in their university's National Collegiate Athletic Association (NCAA) sports teams. NCAA athletes participate in different levels of participation, identified as Division I-III with Division I (DI) being the highest level of competition. These athletes have opportunities and experiences when in sports at the DI collegiate level ranging from receiving a college education, travel, group socialization, merit awards, participation recognition and even life skills training. DI athletes can be awarded partial or full academic scholarships while competing.[8-10,18] This means that these DI athletes' participation in their sport depends on their enrollment and progression in school and vice versa. These student-athletes often have a different college experience than non-athletes due to the responsibilities and regulations as set forth by accepting scholarship monies. NCAA athletes are held to specific standards and regulations laid out by the NCAA manual.[18] These factors can

create additional stress to student-athletes that the general physically-active student may not experience.[8,9]

Injury Classification Related to HRQoL. Health care professionals commonly categorize injuries as acute or chronic. All injuries begin with an inflammatory cycle however it is the healing process that can help categorize an injury as acute or chronic.[14] An acute injury is described as a one-time injury caused by a specific trauma that resolves with very little to no residual effects in the future such as sprained ligaments, contusions, and fractured bones.[14] Conversely, chronic injuries can vary in severity but are most commonly categorized as an injury that is caused by overuse or repetitive micro-trauma that has lasting symptoms with or without treatment for an extended period of time such as arthritis, capsulitis and tendonopathies.[14-16] The main factor that differentiates chronic and acute injures is the time frame of resolution and residual symptoms. Chronic injuries can have longer lasting effects such as consistent pain which can cause further functional disparities.

HRQoL in Collegiate Athletes. Several studies have addressed collegiate athletes' HRQoL. Kleiber et al. conducted a study surveying both football and male basketball players comparing their HRQoL, during competition and immediately at the end of their season.[10] Career ending injuries significantly negatively affected HRQoL.[10] Simon et al. compared former D1 collegiate athletes of all sports to non-collegiate athletes who participated in regular physical activity.[8] Their data supported the following hypotheses; D1 athletes would suffer limitations in daily activities because of a prior injury compared to non-athletes; D1 athletes would have lower HRQoL than non-athletes; and D1 athletes would report competing or practicing (participating in activities)

with an injury during college more so than non-athletes.[8] They also found that people who participated in physical activity 3-5 times per week (former non-athletes) had a higher HRQoL than the general U.S. population.[8] It was noted that former athletes reported to have more limitations in their current activity of daily living and physical activity and more major and chronic injures than the non-athletes. Simon et al. attributed these results to the fact that athletes are more prone to injury during their collegiate participation which could cause lasting effects in adulthood.[8]

In a follow-up study published in 2016, Simon et al. expanded on their earlier work by observing former athletes across all contact levels.[7] They categorized the sports as contact, limited contact and non-contact sports. Their results confirmed that contact athletes had a lower HRQoL than limited contact athletes, even though both were former collegiate athletes. Additionally, Simon et al. found that the former contact athletes reported more chronic injuries than the limited contact group.[7] Several studies have drawn attention to the likelihood that competitive athletes may be more prone to chronic injuries that will continue to affect them post-competition which will could have on-going influence on their HRQoL.[7-10,12] Athletes have an inherent higher risk for injury from their strenuous training schedules necessary to excel in their sport,[8-10,15] which may influence physical activity's effect on HRQoL.

Track and Field and Injury. Currently, little is known about non-contact sport athletes in regards to HRQoL. In general, these athletes are considered at low-risk of injury.[15,19] Given the outcomes of previous HRQoL research on contact and collision sport athletes, it would be valuable to observe the effects of HRQoL in sports with less contact since they are generally considered to be at lower risk for injury. In Track and

Field (T&F) the non-contact nature of the sport leads one to believe that these athletes are less likely to experience injuries; however, the notion is better presented as they are less likely to experience acute traumatic injuries. T&F athletes not only have a high risk for injury, but also are at more risk for overuse and chronic injuries specifically to the lower extremity.[15,19] Track and Field athletes are more prone to suffer from chronic injuries such as tendonopathies, stress fractures, or continuous low back pain which results in longer duration of symptoms which may be a negative impact on HRQoL.[14,15,19] Symptoms from chronic injuries could also affect former T&F athletes who are no longer participating or eligible for competition yet are still experiencing symptoms from injuries sustained during their collegiate career.

Measuring HRQoL. In order to capture the components that form the concept of HRQoL, self-report measures are collected that consider patient values and perspectives on how they perceive their physical and mental health. The importance of capturing HRQoL of patients is to give health care professionals a better understanding of what burden disease and/or disability places on patients in their daily life rather than simply providing a diagnosis or explanation of their physical abilities seen in the clinical setting. Information obtained from HRQoL measures helps practitioners understand patient populations more thoroughly which ultimately leads to better interventions that help patients cope and ultimately gain a more positive overall life experience.

The Short form – 36 (SF-36) is designed to assess eight essential health concepts in order to accurately measure HRQoL.[6] The eight domains of the SF-36 include: physical functioning, role functioning due to physical problems, role functioning due to emotional problems, bodily pain, social functioning, mental health, vitality, and general

health perceptions.[6] Some of the domains are clear in their meaning such as physical functioning, bodily pain and general health perception. Others require an explanation of their meaning. Role Functioning is described as one's ability to work or perform daily activities. Physical role functioning and mental role functioning refer to how much one's ability to work is affected by their physical state or mental state, respectively. Social functioning pertains to how one's physical and emotional health status affects their social life. The mental health aspect of the SF-36 includes one or more items from each of the four major mental health dimensions: anxiety, depression, loss of behavioral or emotional control, and psychological well-being and is expressed as how often one feels these emotions. Lastly, vitality is explained as one's energy level or level of fatigue.[6] Due to this survey's practicality and applicability, the SF-36 is now one of the most commonly used HRQoL tools in healthcare literature and has been validated for use in several populations including the athletic populations.[6,8,10-12]

Measuring Physical Function with Lower Extremity Injury. Health related quality of life was studied in a set of T&F athletes due to the high prevalence of chronic injuries in this population. Because the nature of chronic injuries in this population are commonly to the lower extremity, lower extremity injuries were also focal point. The Lower Extremity Functional Scale (LEFS) is a research and clinical tool used to quantifiably measure functional disabilities of the lower extremity.[22,23] The LEFS has been deemed reliable, valid and sensitive to change.[22] It has been shown to be easy to administer and scored, and applicable to a wide range of people with lower extremity orthopedic conditions. While the LEFS was developed to measure functional disabilities of the lower extremity, it has also been found valid and reliable for the use of measuring the functional

disabilities of patients with low back pain with and without radiating leg pain.[23] Using the LEFS with the SF-36 to measure former athlete's overall health can assist in determining which factors may affect their HRQoL.

The purpose of this study was to observe the effect of chronic lower extremity injuries on HRQoL in current and former Division I T&F athletes. It was hypothesized that former athletes with chronic injuries will report lower HRQoL physical scores than current athletes with chronic injuries and current and former athletes with no injury. Additionally, it was hypothesized that former athletes with chronic injury will report lower HRQoL mental scores than current athletes with chronic injuries and current and former athletes with no injury. Lastly, it was hypothesized that former athletes with chronic injuries will report lower LEFS scores than current athletes with chronic injuries and current and former athletes with no injury.

## II: MANUSCRIPT


### ABSTRACT

**Context:** Physical activity has been shown to increase one's Health Related Quality of Life (HRQoL).[4-7,11] However, current research indicates that athletes may experience lower HRQoL despite their physical activity level.[8-10] Despite the fact that D1 T&F are at high risk for chronic injury and are physically active individuals, little research on the injury impact to HRQoL has be conducted on this population.[15,19]

**Objective:** To study the effect of chronic lower extremity injuries on health related quality of life in current and former Division I T&F athletes.

**Design:** Cross-sectional.

**Setting:** Online survey platform Qualtrics.

**Patients or Other Participants:** 126 current or former Division 1 T&F athletes were included in this study. Forty-seven current athletes and seventy-nine former athletes participated. Of the current and former athletes, there were forty-seven injured athletes and seventy-nine non-injured athletes.

**Main Outcome Measure(s):** Participants were asked to complete an online survey that consisted of four separate sections. The first two sections were general demographic information and injury demographic information. The third section was the 36 item-Short Form survey (SF-36) to measure the participant's HRQoL. The last section was the Lower extremity functional scale (LEFS). Descriptive statistics were used to examine the

data. Non-parametric data statistical analysis was used to examine scores. Statistical significance was set at a priori at $p \leq 0.10$.

**Results:** Current athletes regardless of injury status reported significantly lower SF-36 mental scores than former athletes ($p = 0.02$). Injured athletes regardless of participation status reported significantly lower scores for all measures: SF-36 physical scores (PS) ($p<0.001$), SF-36 mental scores (MS) ($p=0.007$) and LEFS scores ($p<0.001$) when compared to non-injured participants ($p=0.1$). The Kruskul-Wallis test ($\chi 2 = 25.037$) showed statistically significant differences ($p < 0.001$) in SF-36 PS scores between former injured athletes and current non-injured athletes with former injured athletes reporting lower scores. The Kruskul-Wallis test ($\chi 2 = 37.143$) showed statistical significant differences ($p<0.001$) in LEFS scores between current injured athletes and current non-injured athletes with current injured athletes reporting lower scores.

**Conclusions:** The presence of chronic injury regardless of participation status was associated with lower HRQoL and lower extremity functioning scores. Former athletes still experiencing symptoms from an injury from their NCAA participation are reporting significantly lower HRQoL physical and LEFS scores when compared to former athletes that are not experiencing symptoms. Current and former D1 T&F athletes in the present study reported lower HRQoL scores when using normalized data to compare to the general population.[21] T&F is a non-contact sport but more at risk for chronic injury and athletic trainers working in this setting should work towards decreasing the amount of acute injuries that become chronic. They should also begin incorporating HRQoL surveys

or questions into their daily evaluations and follow-ups to ensure they are treating the patient holistically and not missing any aspect of how their injuries are affecting them.

**Word Count.** 455

## INTRODUCTION

In Track and Field (T&F) the non-contact nature of the sport logically leads one to believe that these athletes are less likely to experience injuries. Although, the notion is better presented as they are less likely to experience acute traumatic injuries. Injuries have the ability to affect health related quality of life (HRQoL). HRQoL can be described as how one perceives their health in their daily life.[1, 2] It is broken down into two dimensions-physical and mental. Physical is how one's physical functionality is playing a role in their daily life including their social life and work setting.[1-3] The mental aspect is one's ability to participate in social settings, work settings and everyday tasks with their emotional health and status. It is also refers to how nervous, anxious or depressed one may feel.[4-6] HRQoL has been incorporated into the clinical setting for healthcare professionals.[7] Clinicians such as athletic trainers (ATs) cannot simply observe their patient/athlete and know what their HRQoL is, this is an intricate concept that requires survey instruments and self-reporting from an athlete. However, with HRQoL clearly being shown to affect health ATs could utilize their patients' HRQoL scores to improve their daily clinical decision making to better treat their patients in a holistic manner.

Physical activity has been proven to play a positive role on one's HRQoL in the general population. [4,7-11] However, collegiate athletes, who are indisputable physically active, are reporting lower scores both during and after their collegiate careers.[8-10,12] While there is not a definite explanation for this paradigm, several studies have shown injuries may have a negative effect on HRQoL during and after their competitive careers.[4,8,10,12,13] Due to the nature of sport and athletes pushing their bodies to perform, they are naturally more prone to injuries compared to non-athletes. [8,10,15] Injuries may

play a role in why athletes are reporting lower HRQoL scores despite their physical activity level.

Currently, little is known about non-contact sport athletes in regards to HRQoL. In general, these athletes are considered at low-risk of injury.[15,20] T&F athletes are more at risk for chronic and overuse injuries to the lower extremity and lower back rather than acute traumatic injuries.[15,19] Chronic injuries tend to result in longer durations of symptoms which could create a negative impact on their HRQoL.[14,15,19] Suffering from chronic injuries could also be true for T&F athletes who are no longer participating but are still experiencing residual symptoms from injuries endured during their collegiate career.

The purpose of this study was to observe the effect of chronic lower extremity injuries on HRQoL in current and former Division I T&F athletes. It was hypothesized that former athletes with chronic injuries will report lower HRQoL physical scores than current athletes with chronic injuries and current and former athletes with no injury. Additionally, it was hypothesized that former athletes with chronic injury will report lower HRQoL mental scores than current athletes with chronic injuries and current and former athletes with no injury. Lastly, it was hypothesized that former athletes with chronic injuries will report lower LEFS scores than current athletes with chronic injuries and current and former athletes with no injury.

## METHODS

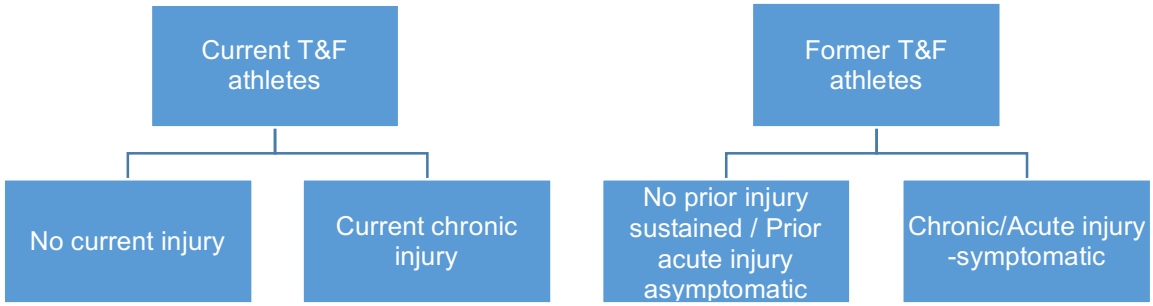
### Design

This study used a cross-sectional survey study design.

### Participants

Participants were current and former NCAA D1 athletes that were recruited through the Texas State University (TXST) T&F team and the TXST Athletic Alumni Foundation databases. Participants qualified for this study if they participated for at least one season with the TXST T&F team or are currently participating on the team. Injuries of current athletes were confirmed by current knowledge of the primary researcher (KP) a certified athletic trainer for the team, while injuries of former athletes were self-reported. As seen in Figure 1 the participants were divided into two main groups: current athletes and former athletes. Both groups were then divided based on T&F sustained injuries and injury symptom status. Table 1 describes inclusion and exclusion criteria for subject participation in the study. Tables 2 and 3 describe the inclusion criteria for each group within the study. Texas State University's Institutional Review Board approved this

**Figure 1:** Participant Grouping



study. (Appendix C)

| **Table 1**: Inclusion and Exclusion Criteria | |
|---|---|
| Inclusion Criteria | • Current TXST T&F athletes with no current injury<br>• Current TXST T&F athletes with a current chronic injury (symptoms for at least 3 months)<br>• Former TXST T&F athletes with at least 1-year participation<br>• Former TXST T&F athletes with injury to the low back or lower extremity |
| Exclusion Criteria | • Current TXST T&F athletes with a current acute injury<br>• Injuries only to the upper extremity |

| **Table 2**: Current Athlete Injury Categories | |
|---|---|
| No current injury | Athletes fall under this category if they:<br>• Never sustained an injury during their NCAA participation<br>• Currently not injured regardless of if they have previously sustained an injury.<br>• Asymptomatic of all past injuries |
| Current chronic injury | Athletes fall under this category if they are:<br>• Currently injured with a chronic injury (symptomatic for at least 3 months)<br>• Currently being treated by the athletic training staff for a chronic injury<br>• Currently symptomatic |

| **Table 3**: Former Athlete Injury Categories | |
|---|---|
| No injury sustained/Prior acute injury-asymptomatic | Former athletes fall under this category if:<br>• They did not sustain any injury in their NCAA participation<br>• Sustained an acute injury from NCAA participation that is no longer symptomatic (considered healed) |
| Chronic/Acute Injury-symptomatic | Former athletes fall under this category if:<br>• Sustained an injury during NCAA participation and still symptomatic. |

| | |
|---|---|
| | • Sustained a chronic injury during NCAA participation that would be painful if continued with physical activity. |

Participant Recruitment

**Current Athletes.** Athletes were recruited in person during a team meeting in. (Appendix D) Individuals agreeing to participate provided their e-mail address on a signup sheet and were informed they would receive an e-mail with an active link to an on-line Qualtrics (Qualtrics, Provo, UT 2015) survey. The survey disbursement schedule can be found in Table 4. A maximum of three follow-up e-mails were sent to those that had not yet completed the survey at 1 week, 2 weeks and 3 weeks after the initial e-mail.

**Former athletes.** To recruit former athletes, e-mail addresses of former T&F athletes were obtained through the TXST T&F and Athletic Alumni Association databases. An e-mail was sent to these former TXST T&F athletes describing the study and requesting their participation. (Appendix E) The recruitment e-mail gave them access to the Qualtrics survey via an active link. A maximum of three follow-up e-mails were sent to those that had not yet completed the survey at 1 week, 2 weeks and 3 weeks after the initial e-mail.

Procedures

All current and former consenting Track and field athletes accessed the survey via an e-mail active link. Accessing the link brought participants to the informed consent page of the survey. As per IRB guidelines, participants read the informed consent (See Appendix F) and by clicking on the link acknowledged their informed consent to participate.

| **Table 4**: Survey Timeline | |
|---|---|
| March 8th 2017 | Send e-mail with active link to access survey |
| March 15th 2017 | Send 1 week reminder e-mail to complete survey |
| March 22nd 2017 | Send 2 week reminder e-mail to complete survey |
| March 29th 2017 | Send 3 week and final e-mail explaining the survey will be closed within the next week |
| April 5th 2017 | Close survey at 4 week mark |

Instrumentation

The survey (Appendix G) was anticipated to take approximately 20 minutes to complete. Sections one and two consisted of participant demographics and their injury demographic information, respectively. Section one was used for group descriptive statistics. Table 5 gives examples of questions included in section one. Section two included injury demographic information of the participants. The injury(ies) classification and description was created by the lead investigator and provided descriptive information regarding the type and nature of the lower extremity and low back injuries sustained by the participants. Table 6 gives examples of questions included in section two.

| **Table 5**: Survey Section 1 Example Questions. |
|---|
| 1. Age |
| 2. Describe your current NCAA participation status |
| 3. Which event(s) did/do you participate in? |

| **Table 6**: Survey Section 2 Example Questions. |
|---|
| 1. Did you sustain an injury during your NCAA participation? |
| 2. Recalling the most significant or debilitating chronic injury that required you to miss at least one day of participation, can you please indicate what type of injury it was? (No participation indicates no type of practice of competition, only rehabilitation or treatment. Please list most severe injury first. |

| |
|---|
| Most severe would be the one that required the largest amount of participation lost. |

Section three included the Short Form Survey-36 (SF-36). The SF-36 is a multi-item survey instrument that has been validated to measure health related quality of life among multiple populations including athletes.[6,7,9,11,12] The investigator obtained a license (Appendix H) through Optum scoring (Version 5.0 Lincoln, RI) which provided Metric Health Outcomes Scoring Software for the interpretation of the data. The SF-36 scores were interpreted using the two main sub-scales of total physical score and total mental score as per the survey design recommendations. These scores should be presented and interpreted individually. For the present study, both the total physical and mental scores were analyzed as independent variables. For each sub-scale the highest obtainable score is 70 points with the overall United States average of 50 points for each.[23] A high score represents a more favorable HRQoL and a low score representing a lower quality of life. Table 7 gives examples of questions included in section three.

**Table 7**: Survey Section 3 Example Questions

| |
|---|
| 1. Compared to one year ago, how would you rate your health in general now? |
| 2. During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?<br>• Cut down the amount of time you spend on work or other activities? |
| 3. During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)? |

Section four of the survey included the Lower Extremity Functional Scale

(LEFS). The LEFS is a patient reported survey instrument that has been validated to measure the functional level of patients with orthopedic disabilities of the low back and lower extremity.[21,22] The LEFS has a minimum detectable change of 9 points.[21] The LEFS consists of 20 questions with a 4-point scale (0-4) for each question resulting in a maximum total of 80 points. A higher score represents better lower extremity functioning capability. Lower scores indicate that participant functionality is more affected by a lower extremity injury/condition. Table 8 gives examples of questions included in section four.

| **Table 8**: Survey Section 4 Example Questions |
|---|
| Today, do you or would you have difficulty at all with: |
| 1. Any of your usual work, housework, or school activities |
| 2. Running on uneven ground |
| 3. Making sharp turns while running fast |

Statistical Analysis

Descriptive statistics were utilized for all study variables and for demographic information. The independent variables in this study were participation status and injury status. The combined grouping created four group classifications as follows: Current athlete with no current injury, current athlete with current chronic injury from sport participation, former athlete with no symptoms from sport injury, former athlete with current chronic symptoms from sport injury. The dependent variables were the SF-36 total physical HRQoL, SF-36 total mental HRQoL and the total LEFS scores.

A Mann-Whitney analysis was utilized for main effects of participation status and injury status for each of the outcome measures. Main effect group comparisons were current athlete versus former athlete and injured athlete versus non-injured athlete. The Mann-Whitney U is a nonparametric equivalent to an independent t-test and uses the

Mann-Whitney U statistic. Once means and standard deviations were calculated using descriptive statistics, Cohen's d and effect size r were calculated. Cohen's d tells the size of difference between each group while the effect size r tells the size of the relationship between groups. From the Cohen's d calculation, the effect size could be indicated. Effect size simply states the size of the difference non-numerically. A Cohen's d value of above .2 indicates a small effect size while above .5 indicates moderate and above .8 indicates large.

A Kruskal-Wallis analysis was utilized for comparisons of combined grouping (participation status x injury status). The Kruskal-Wallis is a non-parametric ANOVA equivalent and uses the Chi-Square statistic. The Kruskal-Wallis calculation is used to note a difference amongst any of the groups compared by calculating a *p*-value but is unable to indicate where the difference is. To do so, post hoc analysis using the means and standard deviations of groups were used to calculate Cohen's d, effect size r, and effect size for each of the outcome measures. As this is an initial investigative effort into this area an *a priori* alpha-level of 0.10 was used to determine significance.

## RESULTS

A total of 144 participants began the survey; after data review 126 subjects were included in the analysis. Of the eighteen participants excluded, one participant was eliminated from further analysis due to incorrect group assignment such as answering that they were a current athlete but their participation years indicated they were not. The remaining seventeen participants were excluded due to incomplete data sets that did not complete the SF-36 and/or LEFS survey components.

Of 55 e-mails sent to current athletes, 47 surveys were completed giving a 85.5% response rate for the current athlete group. Of the 491 e-mails sent to former athletes, 61 e-mails were not able to be delivered (bounced) and 3 duplicate e-mails were deleted. From the remaining 427 e-mails, the researcher received 8 e-mails from participants stating they were not former T&F athletes meaning their e-mails were accidently misclassified by the TXST Athletic Alumni Association. Seventy-nine total surveys were completed of the 419 identified e-mails giving an 18.85% response rate for the former athletes. It is noted that potentially more than just the 8 e-mails may have been misclassified allowing for a higher response rate.

Of the participants, 84% (n=106) completed the survey in 20 minutes or less, taking an average of 11.13 minutes and a range of 4.77-19.22 minutes. The participants that took longer than 20 minutes completed the survey in an average of 964.6 minutes with a range of 20.35 to 8524.13. This broad variation can be explained in that no time limit was placed on the survey and a participant could have stopped the survey and completed at a later time.

### Demographics

**Current and Former Participant Samples.** Participants were separated based on their participation status: current athlete and former athlete. Participation of former athletes was determined by their last year of participation of 1997 to year 2016. Note that while the earliest noted year of participation is 1997, several former athletes contacted the researchers identifying an earlier year of participation. Given the anonymity of the survey, the researchers were unable to connect the participants e-mail information to survey responses. However, it was determined that this would not affect group assignment and their surveys were still included in analysis even if the year was left blank. A total of 47 current athletes and 79 former athletes participated in the study. The demographic information of each group is presented in Table 9.

**Injured and Non-Injured Participant Samples.** Participants were also separated by injury status: currently injured (I) or non-injured (NI). Currently injured was defined as athletes that were suffering from symptoms of a chronic injury sustained during their NCAA participation at the time of survey completion. Non-injured was defined as not currently suffering from symptoms of any injury sustained during their NCAA participation or if they were never injured at all during their participation at the time of survey completion. Demographics of the complete sample population can be found in Table 9

**Table 9**: General Demographics of Complete Sample

| | **n** | **Mean age (SD)** | **Sex** | **Mean years of participation (SD)** |
|---|---|---|---|---|
| All participants | 126 | 32.63 (15.21) | M=62 F=64 | 3.2 (1.37) |
| Current | 47 | 20.19 (1.42) | M=20 F=27 | 2.3 (1.28) |
| Former | 79 | 38.68 (13.46) | M=42 F=37 | 3.75 (1.11) |
| Injured | 47 | 30.45 (14.25) | M=22 F=25 | 3.21 (1.49) |
| Non-Injured | 79 | 32.34 (13.74) | M=40 F=39 | 3.18 (1.3) |

**Cross Tabulation of Injury Status and Participation Status.** Of the 47 current athletes, 21 were currently suffering from symptoms of a chronic injury sustained during their NCAA participation and 26 were not. Of the 79 former athletes 26 were currently suffering from symptoms of a chronic injury sustained during their NCAA participation and 53 were not. A cross tabulation of injury status and participation status are provided in Table 10.

**Table 10**: Cross Tabulation of Injury Status and Participation Status

| | **n** | **Mean age (SD)** | **Sex** | **Mean years of participation (SD)** |
|---|---|---|---|---|
| Current-NI | 26 | 20.08 (1.35) | M=15<br>F=11 | 2.04 (1.04) |
| Current-I | 21 | 20.33 (1.53) | M=5<br>F=16 | 2.62 (1.5) |
| Former-NI | 53 | 38.72 (12.91) | M=25<br>F=28 | 3.78 (1.0) |
| Former-I | 26 | 38.62 (14.72) | M=17<br>F=9 | 3.69 (1.32) |

Descriptives from survey such as total years of participation, event group, current physical activity (PA) level, health care provider preference (HCPP), and reasons for participating while injured can be found in Table 11. Participants were not required to answer every question so participant numbers vary. Most of the current athletes have participated in two years of T&F so far (36.2%) while most of the former athletes completed four years of T&F (63.2%). Events included were; sprints, distance, field, and multi which was identified as participating in 3 or more events. The majority of current athletes (93.6%) described themselves active while only 43.6% of former athletes described themselves as so. The majority of current athletes preferred seeing an AT for evaluation and treatment of their orthopedic injuries (74.5%) while most former athletes

(60.3%) preferred physicians. The majority of both current (57.7%) and former athletes (47.8%) reported that personal drive was the reason they participated while injured.

**Table 11**. Participant Survey Descriptives

| | | Current n(%) | Current I n(%) | Current NI n(%) | Former n(%) | Former I n(%) | Former NI n(%) |
|---|---|---|---|---|---|---|---|
| Total years participation | One | 14 (29.8%) | 4 (19%) | 10 (38.5%) | 6 (7.9%) | 3 (11.5%) | 3 (6%) |
| | Two | 17 (36.2%) | 9 (42.9%) | 8 (30.8%) | 4 (5.3%) | 2 (7.7%) | 2 (4%) |
| | Three | 8 (17%) | 3 (14.3%) | 5 (19.2%) | 7 (9.2%) | 2 (7.7%) | 5 (10%) |
| | Four | 6 (12.8%) | 3 (14.3%) | 3 (11.5) | 48 (63.2%) | 13 (50%) | 35 (70%) |
| | Five w/ red shirt | 1 (0.02%) | 1 (4.8%) | 0 (0%) | 8 (10.5%) | 5 (19.2%) | 3 (6%) |
| | Five w/ medical red shirt | 0 (0%) | 0 (0%) | 0 (0%) | 3 (3.9%) | 1 (3.5%) | 2 (4%) |
| | Six w/ medical and red shirt | 1 (0.02%) | 1 (4.8%) | 0 (0%) | 0 (0%) | 0 (0%) | 0 (0%) |
| | **Total** | **47** | **21** | **26** | **76** | **26** | **50** |
| Event | Sprints | 11 (23.4%) | 6 (28.6%) | 5 (19.2%) | 27 (34.6%) | 9 (34.6%) | 18 (34.6%) |
| | Distance | 17 (36.2%) | 6 (28.6%) | 11 (42.3%) | 25 (32.1%) | 7 (26.9%) | 18 (34.6%) |
| | Field | 14 (29.8%) | 6 (28.6%) | 8 (30.8%) | 17 (21.8%) | 5 (19.2%) | 12 (23.1%) |
| | Multi (3 or more) | 5 (10.6%) | 3 (14.3%) | 2 (7.7%) | 9 (11.5%) | 5 (19.2%) | 4 (7.7%) |
| | **Total** | **47** | **21** | **26** | **78** | **26** | **52** |
| Physical Activity Level | Sedentary | 2 (0.04%) | 1 (4.8%) | 1 (3.8%) | 8 (10.3%) | 1 (4%) | 7 (13.2%) |
| | Moderately Active | 1 (0.02%) | 1 (4.8%) | 0 (0%) | 36 (46.2%) | 12 (48%) | 24 (45.3%) |
| | Active | 44 (93.6%) | 19 (90.5%) | 25 (96.1%) | 34 (43.6%) | 12 (48%) | 22 (41.5%) |
| | **Total** | **47** | **21** | **26** | **78** | **25** | **53** |
| Healthcare Provider Preference | Physician | 9 (19.1%) | 2 (9.5%) | 7 (26.9%) | 47 (60.3%) | 10 (38.5%) | 37 (71.2%) |
| | Athletic Trainer | 35 (74.5%) | 17 (80.9%) | 18 (69.2%) | 7 (9%) | 4 (15.4%) | 3 (5.8%) |
| | Physical therapist | 3 (0.06%) | 2 (9.5%) | 1 (3.8%) | 11 (14.1%) | 6 (23.1%) | 5 (9.6%) |
| | Chiropractor | 0 (0%) | 0 (0%) | 0 (0%) | 9 (11.5%) | 4 (15.4%) | 5 (9.6%) |
| | Other | 0 (0%) | 0 (0%) | 0 (0%) | 4 (5.1%) | 2 (7.7%) | 2 (3.8%) |
| | **Total** | **47** | **21** | **26** | **78** | **26** | **52** |
| Reason for Participation While Injured | Personal drive | 15 (57.7%) | 10 (50%) | 5 (83.3%) | 22 (47.8%) | 11 (55%) | 11 (42.3%) |
| | Pressure from Coach(es) | 3 (11.5%) | 2 (10%) | 1 (16.7%) | 4 (8.7%) | 1 (5%) | 3 (11.5%) |
| | Pressure from teammate(s) | 2 (7.7%) | 2 (10%) | 0 (0%) | 5 (10.9%) | 1 (5%) | 4 (15.4%) |
| | Close to an important meet | 6 (23.1%) | 6 (30%) | 0 (0%) | 11 (23.9%) | 7 (35%) | 4 (15.4%) |
| | Pain/symptoms manageable | 0 (0%) | 0 (0%) | 0 (0%) | 4 (8.7%) | 0 (0%) | 4 (15.4%) |
| | **Total** | **26** | **20** | **6** | **46** | **20** | **26** |

Outcome Variables

The mean, standard deviations, minimum and maximum scores of the SF-36 PS, SF-36 MS and LEFS for each group are presented in Tables 12-14.

**Table 12:** SF-36 Physical Score Descriptive

| | n | Mean (SD) | Minimum | Maximum |
|---|---|---|---|---|
| Current | 47 | 52.98 (3.33) | 45.91 | 60.92 |
| Current- NI | 26 | 53.88 (3.43) | 48.37 | 60.92 |
| Current-I | 21 | 51.86 (2.91) | 45.91 | 57.78 |
| Former | 79 | 51.72 (7.32) | 25.68 | 63.25 |
| Former-NI | 53 | 53.66 (6.39) | 25.68 | 63.25 |
| Former-I | 26 | 47.75 (7.590 | 30.07 | 59.51 |

**Table 13**: SF-36 Mental Score Descriptive

| | n | Mean (SD) | Minimum | Maximum |
|---|---|---|---|---|
| Current | 47 | 37.29 (8.92) | 17.22 | 52.01 |
| Current- NI | 26 | 38.27 (9.98) | 17.22 | 52.01 |
| Current-I | 21 | 36.08 (7.46) | 22.04 | 47.02 |
| Former | 79 | 40.99 (6.96) | 21.96 | 53.30 |
| Former-NI | 53 | 41.49 (6.31) | 23.72 | 50.61 |
| Former-I | 26 | 39.98 (8.17) | 21.96 | 53.30 |

**Table 14**: LEFS Score Descriptive

| | n | Mean (SD) | Minimum | Maximum |
|---|---|---|---|---|
| Current | 47 | 75.68 (6.0) | 54 | 80 |
| Current- NI | 26 | 78.5 (4.02) | 60 | 80 |
| Current-I | 21 | 72.19 (6.27) | 54 | 80 |
| Former | 79 | 70.14 (13.19) | 24 | 80 |
| Former-NI | 53 | 73.17 (11.39) | 24 | 80 |
| Former-I | 26 | 63.96 (14.62) | 24 | 80 |

**Main Effect: Current versus Former Athletes.** Results are shown in Table 15 for comparisons of current athletes versus former athletes for all three outcome variables. Statistical significance ($p$=0.02*)* was found for the SF-36 MS between current and former participants with current athletes reporting lower scores.

**Main Effect: Injured versus Non-Injured Athletes.** Results are shown in Table

15 for comparisons of injured versus non-injured athletes for all three outcome variables. Statistical significance was found for all three outcome variables: SF-36 PS ($p$<0.001), SF-36 MS ($p$=0.077) and LEFS ($p$<0.001) when comparing injured vs non-injured participants, with injured athletes reporting lower scores.

**Table 15**: Mann Whitney Nonparametric Results

| | | Mann-Whitney U | Cohen's d | Effect size r | P value | Level of effect |
|---|---|---|---|---|---|---|
| Current vs Former | SF-36 PS | 1732.5 | 0.22 | 0.11 | 0.53 | Small |
| | SF-36 MS | 1408 | -0.46 | -0.23 | *0.02 | Small |
| | LEFS | 1392.5 | 0.54 | 0.26 | 0.018 | Moderate |
| I vs NI | SF-36 PS | 919.5 | -0.70 | -0.33 | *<0.001 | Moderate |
| | SF-36 MS | 1506.5 | -0.28 | -0.14 | *0.077 | Small |
| | LEFS | 828.5 | -0.65 | -0.31 | *<0.001 | Moderate |

**Cross Tabulation Effect.** When combining both participant status and injury status statistical significance was noted, indicating difference among the 4 group combinations on each of the outcome measures.

**Cross Tabulation Effect for SF-36 PS.** The Kruskul-Wallis test ($\chi 2 = 25.037$) indicates statistically significant differences ($p < 0.001$) in SF-36 PS scores between all groups. Assessing Cohen's d (d = -1.04) and effect size r (r = -0.46) indicates there was a large effect size between the comparison of former injured and current non injured with former injured reporting lower scores. Assessing Cohen's d (d=-0.84) and effect size r (r=-0.39) indicates there was a large effect size between the comparison of former injured and former non-injured with former injured reporting lower scores. The remainder of the effect size results for the SF-36 PS scores can be found in Table 16.

**Table 16**: Level of effect in SF-36 Physical Scores
$p < 0.001$ Chi-Square =25.037

| | Cohen's d | Effect size r | Level of Effect |
|---|---|---|---|
| CI vs FI | 0.72 | 0.34 | Moderate |
| CI vs CNI | -0.64 | -0.30 | Moderate |
| CI vs FNI | -0.36 | -0.18 | Small |
| FI vs CNI | -1.04 | -0.46 | Large |
| FI vs FNI | -0.84 | -0.39 | Large |
| CNI vs FNI | 0.04 | 0.02 | Small |

**Cross Tabulation Effect for SF-36 MS.** The Kruskul-Wallis test ($\chi 2 = 7.57$) indicates statistically significant differences ($p = 0.056$) in SF-36 MS scores amongst all groups. However, there were no large effect size differences within groups. The effect size results for the SF-36 MS scores can be found in Table 17.

**Table 17**: Level of effect in SF-36 Mental Scores
$P = 0.056$ Chi-Square =7.57

| | Cohen's d | Effect size r | Level of Effect |
|---|---|---|---|
| CI vs FI | -0.50 | -0.24 | Moderate |
| CI vs CNI | -0.25 | -0.12 | Small |
| CI vs FNI | -0.78 | -0.36 | Moderate |
| FI vs CNI | 0.19 | 0.09 | Small |
| FI vs FNI | -0.21 | -0.10 | Small |
| CNI vs FNI | -0.39 | -0.19 | Small |

**Cross Tabulation Effect for LEFS.** The Kruskul-Wallis test ($\chi 2 = 37.143$) indicates statistically significant differences ($p < 0.001$) in LEFS scores between all groups. Assessing Cohen's d ($d = -1.20$) and effect size r ($r = -0.51$) indicates there was a large effect size between the comparison of current injured and current non-injured with current injured reporting lower scores. Assessing Cohen's d ($d=-1.36$) and effect size r ($r=-0.56$) indicates there was a large effect size between the comparison of former injured and current non-injured with former injured reporting lower scores. The remainder of the effect size results for the LEFS scores can be found in Table 18.

**Table 18:** Level of effect in LEFS Scores
$p < 0.001$ Chi-Square =37.143

| | Cohen's d | Effect size r | Level of Effect |
|---|---|---|---|
| CI vs FI | 0.73 | 0.34 | Moderate |
| CI vs CNI | -1.20 | -0.51 | Large |
| CI vs FNI | -0.11 | -0.05 | Small |
| FI vs CNI | -1.36 | -0.56 | Large |
| FI vs FNI | -0.70 | -0.33 | Moderate |
| CNI vs FNI | 0.62 | 0.30 | Moderate |

## DISCUSSION

The primary purpose of this study was to observe the effect of chronic lower extremity injuries on HRQoL in current and former D1 T&F athletes. The hypothesis was supported that former athletes with chronic injuries will have lower HRQoL physical scores (SF-36) when compared to current athletes with chronic injures and athletes with no injury regardless of participation status. However, our data did not support lower HRQoL mental scores (SF-36) for former injured athletes. The lowest SF-36 MS were found in both current injured and non-injured athletes. It was also hypothesized that decreased lower extremity functional scale scores would be associated with former athletes with chronic injuries when compared to current athletes with chronic injuries and athletes with no injury regardless of participation status. Our data supported this hypothesis.

### Current vs Former

Regardless of injury status, current athletes reported lower SF-36 MS. The average score for the general population is 50 on the SF-36 MS[23] and our current athlete participants scored an average of 37.29 points. Collegiate athletes have several stressors on a daily basis.[8,9] They have the responsibility of maintaining their grades while also attempting to compete at high levels and with expectations to excel in both areas Based on the author's informal observation, most D1 T&F athletes train to their physical limits each day at practice and then on weekends spend anywhere from six to fourteen hours at a meet with little time nor space to rest and recover during events. In addition, these athletes must maintain a collegiate academic career at least to a level to sustain their scholarship requirements. Once athletes stop competing and move into a professional

career, the more likely exercise is done at a more leisurely level and for general health upkeep rather than for competition, allowing for the positive influence of exercise demonstrated through an increase of HRQoL. While our data are consistent with outcomes from past research, that shows decreased scores on total HRQoL,[8,9] our research separated HRQoL into the mental and physical sub-scales to give a more accurate analysis of where deficiencies may exist.

Injured vs non injured

Participants who reported they were currently suffering from a chronic injury reported significantly lower SF-36 PS, SF-36 MS and LEFS scores regardless of participation status. Chronic injuries can cause lasting symptoms that may affect HRQoL. Track and Field is categorized as a non-contact sport and considered a low risk injury sport but these athletes have been found to be at risk for chronic lower extremity injuries.[15.19] While it has been found that contact athletes suffer from a lower HRQoL when compared to non-contact athletes,[7] it should not be assumed that non-contact athletes are not experiencing any negative effects from their injuries. As shown in our study, both current and former T&F athletes suffering from chronic injuries reported significantly lower HRQoL physical scores and LEFS scores compared to non-injured current or former T&F athletes. Health care providers such as athletic trainers should be aware that chronic symptoms can have negative physical and mental effects on an individual. This also includes acute injuries that become chronic. While we can't demonstrate cause and effect with this cross-sectional study, our study indicates the potential for an association of long term impact of chronic injury on HRQoL in athletes that have otherwise been considered at low risk of injury.

Combined Groups

**HRQoL Physical.** Former athletes who reported suffering from chronic symptoms reported significantly lower SF-36 PS than all other participants. Lower physical scores represent being limited in performing physical activities such as bathing or dressing. Their physical health limited them in their work or other daily activities. This is to be expected with the findings that chronic injuries had a negative effect on injured participants' scores. This study also included an aspect of functionality of the lower extremity using the LEFS. The LEFS score trends reported are similar to the physical HRQoL scores reported by participants previously described. Current injured athletes had lower scores than current non-injured and former injured also reported lower scores than former non-injured athletes. This is helpful in determining that those suffering from lower HRQoL physical scores were also experiencing low functioning levels in their lower extremity compared to the other groups. Although LEFS scores are found to naturally decline with age[25] and direct causation cannot be inferred between those current injured to the former injured athletes, ours is the first study to show a potential concern of on-going chronic injury for these non-contact athletes. We recognize that low LEFS scores in former injured participants may not solely be attributable to injury sustained during their NCAA participation, we did ask participants to answer questions based on symptoms related to an injury from their collegiate career. Anecdotally, one former athlete contacted the researches to inform them she had given birth a few months ago, so it must be noted that more factors can be affecting participant scores than just injuries sustained during their T&F career. This is demonstrated by our data having primarily small and moderate effect sizes when evaluating group assignment.

Our results are also supported by the findings of Simon et al. when observing former collegiate athletes.[7] While they categorized former athletes by contact level, they still found that those suffering from more chronic injuries reported lower HRQoL. In our study, while both former injured and current injured reported lower scores than the uninjured groups, former injured athletes reported significantly lower SF-36 PS. We suggest that this in part is due to the length of time former injured athletes have been experiencing symptoms compared to current athletes. Our study found that 43% of former athletes described their physical activity level as active while 45.6% said moderately active and 10.1% are sedentary. On the contrary, 93.6% of current athletes labeled themselves as active. This clearly demonstrates a downward trend in level of physical activity often expected with age, although the comparison of the rate of decline compared to the general population cannot be made at this time. Research continues to support that physical activity increases HRQoL.[4,8-11] Our study supports these findings because current athletes (physically active individuals) reported higher physical scores even while suffering from a chronic injury when compared to former injured athletes. Current injured athletes, while still experiencing a lower HRQoL in the physical aspect compared to a non-injured current athlete are still experiencing the positive effects of physical activity as described in the literature.[4-8,11]

Another explanation as to why current injured athletes reported higher HRQoL physical scores than former injured athletes could be that all the current participants have daily access to healthcare providers, specifically certified athletic trainers. Athletic trainers are there to manage/treat symptoms associated with any and all injures. Participants were asked to answer which health care providers they had access to and

who they preferred to see regardless of access. All current athletes have access to an athletic trainer, and 74% preferred to see the certified athletic trainer for evaluation and treatment of their orthopedic injuries over other health care providers. Only 6 of the 79 (7.6%) former athletes reported having access to an athletic trainer, and only 58% reported access to a physician with overall 60% of former athletes preferring physicians. The athletic trainer travels to every competition with the current athletes at a majority of Division I school to address any healthcare related issues. Current injured athletes may be receiving more consistent care for their injuries so they may have less severe symptoms and disruptions in their daily life. Health care access differences between the current athletes and former athletes may have mitigated SF-36 PS and LEFS scores. Accessibility to healthcare is an on-going concern in our society. While a full discussion on this topic is beyond the scope of this paper, our findings suggest an importance of the certified athletic trainer in the healthcare of the physically active population to improve patient reported outcomes.

**HRQoL Mental.** Athletes' physical health is easily described by patients and assessed by health care professionals, such as an athletic trainer, during an evaluation. Their physical functionality allows or inhibits them to compete. Problems with mental health are not so easily detected by healthcare providers nor openly reported by athletes. In our study current regardless of injury status athletes reported significantly lower SF-36 mental scores than former athletes. Additionally, current injured athletes had moderately lower scores when compared to former injured athletes and former non-injured athletes. With efforts in healthcare to treat the entire patient, it is important for athletic trainers to be aware of this component of HRQoL. If signs and symptoms of mental distress are

missed or not addressed by healthcare providers it may cause a more problematic issue for the athlete. Providing resources to help athletes address mental health aspects of their injuries is important. Lower SF-36 mental scores indicate emotional problems that can affect work, social activities or cause nervousness or depression. We suggest that injury may place a large toll on current athletes due to already high levels of stress related to their athletic competition in addition to stress experienced by the majority of college students.[8,9] Injury places an athlete in a situation where they may not be competing or not competing to their full potential creating fear of losing their position on a team. These injuries are also time consuming, interfering with regular training schedules, in order to make time for treatment and rehabilitation.

The on-going nature of chronic injury becomes a source of frustration when living and competing in pain.[26] Wiese-Bjornstal et al. explains that competitive athletes may experience greater mood disturbances such as frustration, depression, and anger during injury than recreational athletes because of their urgency to return to sport.[26] In our study, participants were asked how likely they were to participate while injured and why. They were able to select one of the following reasons: personal drive, pressure from coaches, pressure from teammates, close to an important meet, or were able to manage their pain/symptoms enough. Of the current athletes, only one participant answered that they would never participate while injured and only four of the former athletes answered similarly. The majority of both current (57.7%) and former (47.8%) athletes reported personal drive was what pushed them to compete while injured. These collegiate athletes are willing to push themselves to compete through injuries and chronic pain rather than take time off. Our study points out that perhaps when the competitive demand of sport

participation have stopped, a small (or moderate) improvement of the mental aspects of HRQoL may improve, although the competitive nature of the athlete still remains. As a healthcare professions, athletic trainers while suspecting that athletes may push themselves to return quickly and compete while injured, can utilize HRQoL measures to obtain the patient reported outcomes and work with their injured athletes to understand the long term health effects. The results of this study demonstrate that current injured athletes reported the lowest mental scores of all groups. Mental HRQoL questions were in relation to moods such as depression which is a mood disturbance seen in competitive athletes during injury.[26] Feeling the need to quickly return from injury and compete while injured and/or not being able to compete at the level desired due to their injury may affect current athletes.[26] This is another stress factor can continue to explain why current athletes are reporting lower SF-36 MS.

Limitations

In self-report surveys there is always a possibility that questions are not answered accurately or truthfully; although in our study the primary researcher received several e-mail notes of appreciation from participants for looking into this issue for their sport. Former athletes may have had to recall injury and injury symptoms anywhere from 1 to 20 years which may have introduced a recall bias. In an attempt to decrease the extent of recall bias, questions and selection options included detailed descriptors and injury examples. Additionally this study only sampled from one Division 1 University in Central Texas for Track and Field participants which may limit generalizability all collegiate Track and Field athletes.

Lastly, another limitation to this study was the time frame in which it was

completed. It was done in March which is a heavy travel month for T&F and also commonly when midterms are given at universities. The participants in this study were asked to answer these questions in regards to their injuries; however the current athletes could have been experiencing higher levels of stress when completing these surveys due to the simple fact that midterms are a stressful time in the semester. In addition to stress from midterms, they may have been traveling a vast amount which means they may have been arranging test re-takes, or attempting to meet deadlines for assignments while on the road and at track meets. Perhaps, mental scores would have been reported differently if the study was conducted during the summer when the current athletes were not in the middle of their season or taking classes.

## CONCLUSION AND IMPLICATIONS

Current and former D1 T&F athletes suffering from chronic injuries report lower HRQoL and decreased lower extremity functioning compared to their uninjured counterparts. Current athletes, both injured and non-injured reported significantly lower mental HRQoL scores compared to former athletes. When evaluating scores against reported general population US norms, current T&F athletes scored on average 13 points less than the US average.[24] While T&F is a non-contact sport and classified as minimal risk for injury, it should be duly noted that these athletes are at risk for chronic injuries. Our results suggest that chronic injuries may play a detrimental role on HRQoL in both current and former T&F athletes. Athletic trainers and other health care professionals need to consider how chronic injuries may have effects on HRQoL that can extend well beyond the competitive years of collegiate athletes. Patient education on the potential for chronic symptoms of even acute injuries during the rehabilitation process is at minimum a start to addressing this underappreciated healthcare concern of competitive low-risk injury athletes.

Athletic trainers commonly see their athletes regularly whether the athlete is injured or not. It could be worthwhile as their athletic trainer to continuously remind their athletes of the resources they have available to them such as on campus counseling or tutoring to help with the stressors of being a Division 1 athlete to help with their HRQoL. As health care providers, it is essential to ensure we are treating the whole patient and not just the injury. Current athletes had significantly lower mental HRQoL scores and may need extra support to address feelings such as depression and anxiousness. This could be especially true for those experiencing injury. They may benefit from additional resources

to learn how to cope with how an injury is impacting their life. ATs should attempt to include HRQoL aspects into their evaluations and daily interactions by having more conversations of how an injury is affecting their athletes. This may give the athletic trainer a better idea of who may need additional resources to cope with their injury status while the athletic trainer attempts to heal their injury.

## III: SUMMARY AND FUTURE RESEARCH RECOMMENDATIONS

Results from this study suggest that there is an association between chronic injury of the lower extremity and HRQoL in current and former T&F athletes. While these athletes have been labeled as having a low risk for injury, our study pushes for the need of more research on this population. Injuries sustained during college have the possibility of becoming a chronic issue for former athletes which means even if they are no longer participating they are experiencing some type of effect from their collegiate career on their HRQoL. Current athletes with injury reported the lowest mental scores compared to all other groups. ATs should be aware that athletes can have negative effects from injuries that go past just physical limitations

Future research should be done on this topic to expand on our findings. To address issues of causality we would suggest a longitudinal based investigation, looking at change over the course of a season, through their college athletic career, and periodically beyond their competition years. Inclusion of these surveys as part of the baseline physical examination would help to establish normative references from which track and field athletes can compare. Future research should also expand to include more institutions and at varying levels of competition. This would allow for more generalizability to other T&F teams. Expanding future studies to include other high chronic injury rates can broaden the information on collegiate competitive sport and its impact on HRQoL. Continuing to demonstrate that although at low-risk for acute injury, the importance of access to healthcare and engagement with knowledgeable healthcare professionals can help improve the long-term HRQoL.

Additionally, future studies could expand on the present study by using the SF-36

broken down further into its eight domains. This would naturally allow more detail in interpreting the data to see where athletes are suffering most in the components of HRQoL. In continuing with this research, it would be helpful to create and validate more surveys for HRQoL that are geared towards clinical practice rather than just research usage. This would give clinicians the ability to incorporate HRQoL aspects into their evaluations with patients and daily interactions. By doing so, athletic trainers could keep track of their athlete's progress and if they come across an athlete that is declining in their scores this would be indicative of a referral to another health care professional such as a counselor who could teach them coping mechanisms to better deal with the stress of being an athlete or the negative emotions that come from being injured.

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## APPENDIX SECTION

# APPENDIX A: OVERVIEW OF THE STUDY

Purpose of Study: The purpose of this study is to observe the effect of chronic lower extremity injuries on health related quality of life in current and former Division I Track and Field athletes.

Hypotheses:

- It is hypothesized that former athletes with chronic injuries will report lower HRQoL physical scores when compared to former athletes without injury and current athletes regardless of injury status.
- It is hypothesized that former athletes with chronic injuries will report lower HRQoL mental scores when compared to former athletes without injury and current athletes regardless of injury status.
- It is hypothesized that former athletes will report lower LEFS scores when compared to former athletes without injury and current athletes regardless of injury status.

Assumptions:

- All participants were either current or former track and field athletes from Texas State University
- Participants fully complied with all aspects of the research protocol by completing the survey truthfully and accurately to the best of their knowledge
- Participants understood all questions and correctly identified themselves in the appropriate grouping categories
- The survey software and scoring software used were reliable and accurate

Delimitations:

- This study is delimitated by the recruitment of current and former Division one track and field athletes from Texas State University

Limitations:

- Surveys are self-reported
- The former athletes had to recall injuries that happened in the past which may have been difficult to remember details of symptoms
- This study was a cross-sectional survey design so we are unable to infer causation of results
- The current athlete population group was limited to the amount of athletes currently on the team which led to a smaller population size than the former athlete group
- Due to it being an online survey, those without access to technology would not be able to participate

Operational Definitions:

- Acute injury- a one-time injury caused by a specific sudden trauma that resolves with very little to no residual effects in the future such as contusions and fractured bones.[14]
- Chronic injury – injury that is caused by overuse or repetitive micro-trauma that has lasting symptoms with or without treatment for an extended period of time such as arthritis and tendonpathies.[14] This also included acute injuries that developed chronic symptoms (>3 months)
- Current Athlete- A person that was participating on the Texas State Track and Field team at the time of the study
- Former Athlete- A person who's participation on the Texas State Track and field team ended prior to the start of the study. They were required to have completed at least one full indoor or outdoor season. A person that formerly participated on the Texas State Track and Field team for at least one full track indoor or outdoor season.

Recommendations for Future Research

- Diversify the patient population to encompass more than one university and differing competition levels such as D2 or D3.
- Diversify the patient population by researching other non-contact sports that are labeled as low-risk for injury such as swimming or tennis that may be at higher risk for chronic injuries similar to T&F
- Increase the amount of total study participants to increase statistical power of the study
- Create a longitudinal study to measure participants HRQoL throughout each season and at check point years once they are done competing
- Conduct a study where the SF-36 is broken down into its 8 domains to observe the participants score within each domain rather than just their total physical and mental score.

# APPENDIX B: LITERATURE REVIEW

Health related quality of life (HRQoL) is a multifaceted concept that has continued to evolve since the 1980s.[1,2] The Center for Disease Control (CDC) defines HRQoL as a concept that "encompasses those aspects of overall quality of life that can be clearly shown to affect health—either physical or mental."[1,3] The physical aspect of HRQoL is how one's physical functionality plays a role in their daily life, social activities and/or work setting. The mental aspect is one's mental state and how that plays a role in their everyday life. The mental aspect also takes into account how anxious, nervous, or depressed one may feel in their daily life.[4-6] HRQoL has become a widely-accepted focus in public health research and clinical decision making for health care professionals.[7] A clinician, such as an athletic trainer cannot simply observe their athlete and know what their HRQoL is, this is an intricate concept that requires survey instruments self-reporting from an athlete. However, with HRQoL clearly being shown to affect health, ATs are responsible for maintain their health and this includes both physical and mental. ATs could utilize their patients' HRQoL scores to improve their daily clinical decision making to better treat their patients in a holistic manner.

People that are physically active have been shown to have a higher quality of life when compared to non-active individuals.[4,7-11] However, research has contradicting results when evaluating collegiate athletes. Previous studies have evaluated differences between current athletes and former athletes as well as current collegiate athletes and current general students. Former collegiate athletes are more likely to have a lower HRQoL compared to former students that did not participate in collegiate athletics and current athletes are reporting lower HRQoL scores than current students who are

physically active.[8-10] Collegiate athletes can indisputably be described as physically active but are for some reason reporting lower scores during and after their athletic collegiate careers.[8-10,12] This research area has not yet established a clear reason as to why collegiate athletes may report lower HRQoL, although several studies have shown injuries may have a negative effect on HRQoL during and after their competitive careers.[4,8,10,12,13] Given that athletes are more prone to experience multiple injuries compared to non-physically active individuals, the impact of injuries on the HRQoL needs further investigation.[8,10,15]

The Competitive Nature of Physical Activity. Athletic participation in the United States often begins in adolescence.[16,17] However the competitive nature of sport naturally increases with age during high school and again in the collegiate setting due to factors such as scholarships, awards, television broadcasts, among others.[18] There are several opportunities for one to participate athletically at their university through intramural sports, club sports, physical education classes or even Greek life activities. Intramural sports tend to be organized among students who are interested in playing a specific sport for recreation. They are not funded nor regulated by a governing body such as the National Collegiate Athletic Association (NCAA). Club sports are also not funded or regulated by the NCAA but tend to have more structure than intramural sports. Club sports have opportunities to compete against other institutions with the same club sports.

The most recognized and regulated athletes in the collegiate setting are those participating in their university's National Collegiate Athletic Association (NCAA) sports teams. NCAA athletes participate in different levels of participation, identified as Division I-III with Division I (D1) being the highest level of competition. These athletes

have opportunities to access different types of advantages and experiences when in sports at the collegiate level ranging from receiving a college education, travel, group socialization, merit awards, participation recognition and even life skills training. DI athletes can also be awarded partial or full academic scholarships while competing.[8-10] This means that these DI athletes' participation in their sport depends on their enrollment and progression in school and vice versa. These student-athletes have a different college experience than non-athletes due to the set of responsibilities as set forth by accepting scholarship monies. NCAA athletes are held to specific standards and regulations clearly laid out by the NCAA handbook.[18] These factors create an extra level of stress to student-athletes that the general physically-active student may not experience.[8,9]

General Athletes and HRQoL. Several studies have evaluated HRQoL in athletes and former athletes but have found contradicting results. Sguizzatto et al. compared women aged 60 and over who were either characterized as athletes or sedentary and found that regular physical activity and high performance sports have a positive effect on HRQoL. [11] More recently, in 2016 both Moreira et al. and Barbosa et al. published studies related to athletes and HRQoL.[9,12] Moreira et al. investigated effects of sport injury and the level of physical activity on HRQoL. Participants were current Brazilian basketball players and were asked about injuries and physical activity levels which may have been decreased due to injury. Their results showed that those athletes having a higher prevalence of injury consequently decreased their physical activity and reported a lower HRQoL. Barbosa et al. attempted to determine predictors of HRQoL in former athletes in Brazil. [12] Their sample consisted mainly of most overweight former athletes without chronic problems. Their study found that two out of ten participants reported that their

sports career ended due to injury. Current occupation, body mass index, use of prescription medicine, chronic problems and sports injures that affect current daily living were factors associated with lower physical and mental health. These studies indicate that chronic injuries affecting current living may help explain why former athletes experience a lower HRQoL compared to non-athletes.

HRQoL in Collegiate Athletes. Several studies have addressed collegiate athletes' HRQoL. Kleiber et al. conducted a study surveying both football and male basketball players comparing their HRQoL, during competition and immediately at the end of their season.[10] Career ending injuries significantly negatively affected HRQoL.[10] Simon et al. compared former D1 collegiate athletes to non-collegiate athletes who participated in regular physical activity.[8] Their data supported the following hypotheses; D1 athletes would suffer limitations in daily activities because of a prior injury compared to non-athletes; D1 athletes would have lower HRQoL than non-athletes; and D1 athletes would report competing or practicing with an injury during college more so than non-athletes.[8] They also found that people who only participated in physical activity 3-5 times per week (non-former athletes) had a higher HRQoL than the general U.S. population.[8] It was noted that former athletes reported to have more limitations in their current activity of daily living and physical activity and more major and chronic injures than the non-athletes. Simon et al. attributed these results to the fact that athletes are more prone to injury during their collegiate participation which could cause lasting effects in adulthood.[8]

In a follow-up study published in 2016, Simon et al. expanded on their earlier work by observing former athletes across all contact levels.[7] They categorized the sports

as contact, limited contact and non-contact sports. Their results confirmed that contact athletes had a lower HRQoL than limited contact athletes, even though both were former collegiate athletes. Additionally, Simon et al. found that the former contact athletes reported more chronic injuries than the limited contact group.[7] Several studies have drawn attention to the likelihood that competitive athletes may be more prone to chronic injuries that will continue to affect them post-competition which will could have on-going influence on their HRQoL.[7-10,12] Athletes have an inherent higher risk for injury from their strenuous training schedules necessary to excel in their sport,[8-10,15] which may influence physical activity's effect on HRQoL.

Injury Classification Related to HRQoL. Health care professionals commonly categorize injuries as acute or chronic. All injuries begin with an inflammatory cycle however it is the healing process that can help categorize an injury as acute or chronic.[14] An acute injury is described as a one-time injury caused by a specific trauma that resolves with very little to no residual effects in the future such as sprained ligaments, contusions, and fractured bones.[14] Conversely, chronic injuries can vary in severity but are most commonly categorized as an injury that is caused by overuse or repetitive micro-trauma that has lasting symptoms with or without treatment for an extended period of time such as arthritis, capsulitis and tendonopathies.[14,15,19] The main factor that differentiates chronic and acute injures is the time frame of resolution and residual symptoms. Chronic injuries can have longer effects such as consistent pain which can cause further functional disparities.

Collegiate Athletes and Access to Health Care. Current D1 athletes have access to several health care providers such as athletic trainers, physical therapists, and physicians

with specialties such as general medical, orthopedics, podiatry, and neurology.[20] It is common practice for an athlete to be able to see their athletic trainer on a daily basis for evaluation, treatment, and rehabilitation of their injury and can also see other health care providers quickly if injured, compared to the general population. Conversely, once someone is no longer an NCAA athlete because they quit the team, graduate or exhaust their NCAA eligibility they will no longer have immediate access to health care. Previous studies have not specifically mentioned the effect of health care access on the general health of former collegiate athletes or on injury status. However, if former collegiate athletes no longer have immediate health care access to assist with their chronic or acute injuries related to their participation they may experience lasting symptoms that affect their long-term physical and mental health. D1 athletes will transition every day access to an athletic trainer to becoming part of the general population that commonly needs to go through many more steps of scheduling appointments with their primary health care providers to evaluate an injury. This may be an explanation as to why former collegiate athletes have a lower HRQoL even though physically active individuals tend to have a higher HRQoL.

Track and Field and Injury

Currently, little is known about non-contact sport athletes in regards to HRQoL. In general, these athletes are considered at low-risk of injury.[15,20] Given the outcomes of previous HRQoL research on contact and collision sport athletes, it would be valuable to observe the effects of HRQoL in sports with less contact since they are generally known to be at lower risk for injury. In Track and Field (T&F) the non-contact nature of the sport logically leads one to believe that these athletes are less likely to experience

injuries. Although, the notion is better presented as they are less likely to experience acute traumatic injuries. T&F athletes not only have a high risk for injury, but also are at more risk for overuse and chronic injuries specifically to the lower extremity.[15,19] T&F athletes are more prone to suffer from chronic injuries such as tendonopathies, stress fractures, or continuous low back pain which results in longer durations of symptoms which could create a negative impact on their HRQoL.[14,15,19] Suffering from chronic injuries could also be true for T&F athletes who are no longer participating but are still experiencing residual symptoms from injuries endured during their collegiate career.

Measuring HRQoL. In order to capture the components that form the concept of HRQoL, self-report measures are collected that consider patient values and perspectives on how they perceive their physical and mental health. The importance of capturing HRQoL of patients is to give health care professionals a better understanding of what burden disease and/or disability places on their patients in their daily life rather than simply providing a diagnosis or explanation of their physical abilities seen in the clinical setting. Information obtained from HRQoL measures helps practitioners understand patient populations more thoroughly which ultimately leads to interventions that may help patients cope and ultimately gain a more positive overall life experience.

HRQoL has been evolving since the 1980s and this includes how it is measured.[1,2] In 1979 Health and Human Services developed the Healthy People initiative which was most recently modified to Healthy People 2020.[21] Healthy People 2020 is a public health planning tool designed to measure health progress over time with set objectives to promote improved overall health of the general population annually.[21] The two main goals of Healthy People 2020 are; 1. To increase the quality and years of healthy life and

2. To eliminate health disparities. In order to monitor the nation's progress, HRQoL tools are necessary to formulate quantifiable results.

In an attempt to better survey the general population's HRQoL, the Center for Disease Control (CDC) held two workshops in 1991 and 1992 where experts in the field developed the Core Healthy Days Measures.[2,4] This consisted of four questions related to HRQoL to be used in the Behavioral Risk Factor Surveillance System (BRFSS).[2,4] The BRFSS is a health related system used by the CDC to conduct health-related telephone surveys in order to collect data on U.S. residents in all 50 states and the District of Columbia (DC)[4,13] The core health days measures questions have the participant answer four questions of how they perceive their health; 1 is regarding their general health, 2 is regarding their physical health over a 30 day period, 3 is regarding their mental health over a 30 day period and 4 is regarding both their physical health and mental health during a 30 day period. These four questions have been proven valid and reliable and are able to predict morbidity, health-care use, and mortality and have been shown that scores can be associated with chronic diseases, disability, risky health behaviors, and sociodemographic factors.[14]

The Healthy Days' questions were beneficial in a national survey because they are concise and easily answered by the individual over a phone conversation. It is also beneficial for the general population because it is not specific to any age, disease or treatment. However, there are other patient reported surveys to measure HRQoL that have been validated and used on specific populations and that will provide a more detailed overall response. These tools are commonly much longer than the Healthy Days questions but this is because they are not being used on the entire nation, rather a

specified population for research.

In order to obtain detailed research on a large scale, while still maintaining practicality, tools such as the Short Form Health Survey 36 (SF-36) were designed. The SF-36 was developed in 1992 as an extension to the 18-item and 20-item short form surveys that had been used since 1985.[6] The SF-36 assesses eight essential health concepts in order to accurately measure HRQoL.[6] While the SF-36 was an expansion, it was still considered practical and most importantly more valid for obtaining data measuring general health concepts. The SF-36 is designed to assess eight essential health concepts in order to accurately measure HRQoL.[6] The eight domains of the SF-36 include: physical functioning, role functioning due to physical problems, role functioning due to emotional problems, bodily pain, social functioning, mental health, vitality, and general health perceptions.[6] Some of the domains are clear in their meaning such as physical functioning, bodily pain and general health perception. Others require an explanation of their meaning. Role Functioning is described as one's ability to work or perform daily activities. Physical role functioning and mental role functioning refer to how much one's ability to work is affected by their physical state or mental state, respectively. Social functioning pertains to how one's physical and emotional health status affects their social life. The mental health aspect of the SF-36 includes one or more items from each of the four major mental health dimensions: anxiety, depression, loss of behavioral or emotional control, and psychological well-being and it is expressed as how often one feels these emotions. Vitality is explained as one's energy level or level of fatigue.[6] Due to its practicality and applicability the SF-36 is now one of the most commonly used HRQoL tools in healthcare literature and has been validated for use in

several populations including the athletic populations.[6,8,10-12]

The purpose of this study was to observe the effect of chronic lower extremity injuries on HRQoL in current and former Division I T&F athletes. T&F athletes' HRQoL were studied due to their high prevalence of chronic injuries using the SF-36 but because injuries are found to most commonly affect the lower extremity, lower extremity injuries were also focal point. The Lower Extremity Functional Scale (LEFS) is a research and clinical tool used to quantifiably measure functional disabilities of the lower extremity.[22,23] The LEFS has been deemed reliable, valid and sensitive to change.[22] It was shown to be easy to administer and score and applicable to a wide range of individuals specifically with lower extremity orthopedic conditions. However, it was shown to measure physical function and not general health status so it is helpful to use in conjunction with an overall health status measure such as the SF-36.[22] While the LEFS was developed to measure functional disabilities of the lower extremity, it has also been found valid and reliable for the use of measuring the functional disabilities of patients with low back pain with and without radiating leg pain.[23] Using the LEFS with the SF-36 to measure former athlete's overall health can assist in determining which factors may affect their HRQoL.

An initial step of this study was to determine critical components of athletic participation and injury that can help to identify T&F athletes that are at risk of chronic injury. It was hypothesized that former athletes with chronic injuries will report lower HRQoL physical than all other groups. It was also hypothesized that former athletes with chronic injuries will report lower mental scores when compared to current athletes with chronic injuries and athletes with no injury regardless of participation status.

Additionally, it was hypothesized that former athletes will report lower LEFS scores when compared to current athletes with chronic injuries and athletes with no injury regardless of participation status.

# APPENDIX C: IRB APPROVAL LETTER

In future correspondence please refer to 2017556

Dear Ms.

Penilla:

Your IRB application 2017556 titled “Effects of Chronic Lower Extremity Injury on Health Related Quality of Life in Current and Former Division I Track and Field Athletes.” was reviewed and approved by the Texas State University IRB. It has been determined that risks to subjects are: (1) minimized and reasonable; and that (2) research procedures are consistent with a sound research design and do not expose the subjects to unnecessary risk. Reviewers determined that: (1) benefits to subjects are considered along with the importance of the topic and that outcomes are reasonable; (2) selection of subjects is equitable; and (3) the purposes of the research and the research setting is amenable to subjects’ welfare and producing desired outcomes; that indications of coercion or prejudice are absent, and that participation is clearly voluntary.

1. In addition, the IRB found that you need to orient participants as follows: (1) signed informed consent is not required as participation will imply consent; (2) Provision is made for collecting, using and storing data in a manner that protects the safety and privacy of the subjects and the confidentiality of the data; (3) Appropriate safeguards are included to protect the rights and welfare of the subjects.

**This project is therefore approved at the Exempt Review Level**

2. Please note that the institution is not responsible for any actions regarding this protocol before approval. If you expand the project at a later date to use other instruments please re-apply. Copies of your request for human subjects review, your application, and this approval, are maintained in the Office of Research Integrity and Compliance. Please report any changes to this approved protocol to this office.

Sincerely,

Monica Gonzales
IRB Regulatory Manager
Office of Research Integrity and Compliance

OFFICE OF THE ASSOCIATE VICE PRESIDENT FOR RESEARCH
601 University Drive | JCK #489 | San Marcos, Texas 78666-4616
*Phone:* 512.245.2314 | *fax:* 512.245.3847 | WWW.TXSTATE.EDU

## APPENDIX D: IN PERSON RECRUITMENT SPEECH

Hello, my name is Kimberly Penilla. I am a researcher at Texas State University. I am conducting a research study about the effects of chronic lower extremity injury on health related quality of life in current and former division 1 track and field athletes. I am speaking to you to ask if you would be willing to participate in my research by completing an online survey. It should take about 20 minutes to complete the survey.

You qualify for this study if you are currently uninjured or if you are currently suffering from a chronic injury. As your current athletic trainer, I can assist in deciding if you qualify for this study.

If you are willing to participate please provide your e-mail on this sign-up sheet. You will receive an e-mail within the next week with an active link to take the survey.

Please look for the Subject Line: Research Participation Invitation: Health Related Quality of Life in Current and Former Track and Field Athletes

If you have questions, I can be reached at 714-504-5084 or Kdp96@txstate.edu

Thank you for your time, it is very much appreciated.

APPENDIX E: FORMER ATHLETE RECRUITMENT EMAIL

To: Kdp96@txstate.edu
From: Kdp96@txstate.edu

BCC: Current and former athlete e-mails
Subject: Research Participation Invitation: Health Related Quality of Life in Current and Former Track and Field Athletes

This email message is an approved request for participation in research that has been approved or declared exempt by the Texas State Institutional Review Board (IRB).

My name is Kimberly Penilla and I am a graduate assistant certified athletic trainer with the current Texas State University track and field team. I am requesting your participation in my study because you are a **former** Texas State University track and field athlete, **either** with or without a chronic injury. The purpose of my study is to investigate if quality of life is affected by chronic lower extremity injury, by comparing current and former athletes with and without injuries.

This survey is completely voluntary however your participation is vital to my research since you have the unique point of view as a former division 1 athlete. Your answers to this survey will be confidential. The survey is anticipated to take 20 minutes. There are no risks associated with participating in my study and your answers are completely confidential and only information in aggregate will be reported.

To participate in this research, please click on the link below to be directed to the web based survey.

**Survey link**

If you have any questions about this research, please feel free to contact me at:

Kimberly Penilla

Cell: 714-504-5084

Email: Kdp96@txstate.edu

This project 2017556 was approved by the Texas State IRB on February 28th 2017. Pertinent questions or concerns about the research, research participants' rights, and/or research-related injuries to participants should be directed to the IRB chair, Dr. Jon Lasser 512-245-3413 – (lasser@txstate.edu) or to Monica Gonzales, IRB administrator 512-245-2314 - (meg201@txstate.edu).

# APPENDIX F: INFORMED CONSENT

Kimberly Penilla, a graduate student at Texas State University, is conducting a research study to observe the effect of chronic lower extremity injuries on health related quality of life in current and former Division 1 track and field athletes. You are being asked to complete this survey because you are either a current or former Texas State University Track and Field athlete.

Participation is voluntary. The survey will take approximately 20 minutes or less to complete. You must be at least 18 years old to take this survey.

This study involves no foreseeable serious risks. We ask that you try to answer all questions; however, if there are any items that make you uncomfortable or that you would prefer to skip, please leave the answer blank. If you volunteer to be in this study you may withdraw from this study at any time without consequences at any time or loss of benefits that you are otherwise entitled. Your responses are confidential.

If you have any questions or concerns, feel free to contact Kimberly Penilla or her faculty advisor:


| | | |
|---|---|---|
| | **Kimberly Penilla, Graduate student Health and Human Performance** | **Marie Pickerill, Faculty Health and Human Performance** |
| | **(714)504-5084** | **(512)245-8047** |
| | **Kdp96@texasstate.edu** | **Mariepickerill@texasstate.edu** |


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If you would prefer not to participate, please do not fill out a survey.

If you consent to participate, please complete the survey.

## APPENDIX G: QUALTRICS SURVEY

Thesis Survey

C1 Welcome to the survey "Health Related Quality of Life in Current and Former Track and Field Athletes" Thank you again for your interest in participating. As a brief reminder, this survey is completely voluntary and your answers to this survey will be confidential. The survey is anticipated to take 20 minutes. There are no risks associated with participating in my study and your answers are completely confidential and only information in aggregate will be reported. To participate in this research, please continue on to the next section which will be your consent to participate.

D1 Age (type number only please)

D2 Sex

Male (0)
Female (1)

D3 Describe your current NCAA participation status

Currently participating as a NCAA track and field athlete (0)
Formerly participated as a NCAA track and field athlete (1)

D4 Please select the years that coincide with the indoor and outdoor seasons you were a participant on the TXST track and field team. (Select all that apply)Example: If you started as a freshman at TXST in fall 2000 and completed in the spring of 2001 - 2004, you would check the boxes by 2001, 2002, 2003,

2004.

1997 (1)
1998 (2)
1999 (3)
2000 (4)
2001 (5)
2002 (6)
2003 (7)
2004 (8)
2005 (9)
2006 (10)
2007 (11)
2008 (12)
2009 (13)
2010 (14)
2011 (15)
2012 (16)
2013 (17)
2014 (18)
2015 (19)
2016 (20)
2017 (21)

D5 How many total years have you completed as a NCAA track and field athlete?* Current athlete-please select which year you are currently participating in.

1 (1)
2 (2)
3 (3)
4 (4)
5-with a red shirt (5)
5-with a medical red shirt (6)
6-with a red shirt and medical red shirt (7)

D6 Including both indoor and outdoor season, how many total seasons have you participated in? *Current athletes- please select based on which season you are

currently in (ex: Currently participating in first indoor season-select “1”)

1 (1)
2 (2)
3 (3)
4 (4)
5 (5)
6 (6)
7 (7)
8 (8)
9 (9)
10 (10)
11 (11)
12 (12)

D7 Which event(s) did/do you participate in? (Select all that apply)

Sprints (less than 400m) (1)
Middle distance (600-1mile) (2)
Distance (greater than 1 mile) (3)
Hurdles (4)
Jumping (5)
Pole vault (6)
Throwing (7)

D8 How physically active are you currently?

Sedentary- Do not participate in any physical activity on a regular basis (1)

Moderately active- Participate in physical activity on a consistent bases (1-3 x a week for at least 30 minutes) (2)

Active- Participate in physical activity 4-7 x per week for at least 30 minutes. (3)

D9 What type of health care provider do you currently have access to for evaluation of orthopedic issues? (Select all that apply)

Physician (1)
Athletic trainer (2)
Physical therapist (3)
Chiropractor (4)
Other (5) _____

D10 Which health-care provider do you prefer to see regardless of access for

evaluation of orthopedic issues?

Physician (1)
Athletic trainer (2)
Physical therapist (3)
Chiropractor (4)
Other (5) _____

I1 Did you sustain an injury during your NCAA participation?

Yes (1)
No (0)

Condition: No Is Selected. Skip To: End of Block.

I2 How would you describe your current injury status?

I DO notice current symptoms that have persisted 3 months or longer (e.g. nagging, aches, pain, swelling, tenderness, soreness etc.) from the SAME injury/injuries that I sustained during my NCAA participation? (1)

I DO NOT notice any current symptoms from an injury/injuries that I sustained during my NCAA participation (0)

I3 Which of the following musculoskeletal injuries did you sustain as a NCAA athlete. (Please only consider injuries sustained during your NCAA athletic participation, not the years following your NCAA eligibility, extracurricular activities, or accidents that happened while not participating)

Acute There was a specific mechanism that caused this injury. Once healed, you could participate and no longer needed treatment or rehabilitation from the athletic training staff. Examples Muscle strain (i.e. "pulled muscle") Muscle spasm Ligament sprain (i.e. sprained/twisted your ankle,knee etc) Dislocation/subluxation (when the joint shifts or pops out, it may go back by it self, or had to be put back by someone) Bursitis Fracture (i.e. broken bone NOT a stress fracture.) (1)

Chronic Symptoms have persisted 3 months or longer Caused from: overuse or repetitive trauma; never fully healed with continued participation; heals during extended rest but returned with resumed activity. This also includes acute injuries that became a chronic issue. Examples Tendinitis/tendinopathy (most often affects the Achilles, patellar tendon) Plantar fasciitis (pain at located on the bottom of your foot a the front of your heel, especially painful with 1st steps) Medial tibial

stress syndrome (i.e., shin splints)  Bursitis Stress fracture Low back injury  (2)

Both Acute and Chronic (4)

Display This Question:

If Which of the following musculoskeletal injuries did you sustain as a NCAA athlete. (Please only consider injuries sustained during your NCAA athletic participation, not the years following your NCA... Acute <ul> <li>There was a specific mechanism that caused this injury. Once healed, you could participate and no longer needed treatment or rehabilitation from the athletic training staff.</li> <li>Examples <ul> <li>Muscle strain (i.e. "pulled muscle")</li> <li>Muscle spasm</li> <li>Ligament sprain (i.e. sprained/twisted your ankle,knee etc)</li> <li>Dislocation/subluxation (when the joint shifts or pops out, it may go back by it self, or had to be put back by someone)</li> <li>Bursitis</li> <li>Fracture (i.e. broken bone NOT a stress fracture.)</li> </ul> </li> </ul> Is Selected

Or Which of the following musculoskeletal injuries did you sustain as a NCAA athlete. (Please only consider injuries sustained during your NCAA athletic participation, not the years following your NCA... Both acute and chronic Is Selected

I4 Recalling the most severe or traumatic acute injury that required you to miss at least one day of participation, can you please indicate what type of injury it was? (No participation indicates no type of practice or competition only rest, rehabilitation, or treatment. Please list most severe injury first. Most severe would be the one that required the largest amount of participation lost or the most painful symptoms.)

Bone fracture or contusion (e.g. broken bone, bone bruise) (1)

Muscle strain or tear (e.g.pulled or torn muscle) (2)

Ligament sprain or rupture (e.g. rolled an ankle) (3)

Tendon rupture (4)

Soft tissue contusion (e.g. bruises) (5)

Other- please specify (6) _____

Display This Question:

If Which of the following musculoskeletal injuries did you sustain as a NCAA athlete. (Please only consider injuries sustained during your NCAA athletic participation, not the years following your NCA... Chronic <ul> <li>Caused from: overuse or repetivie trauma; never fully healed with continued particiaption; heals during extended rest but returned with resumed activity. This also includes acute injuries that became a chronic issue.</li> <li>Examples <ul> <li>Tendonitis/tendinopathy (most often affects the Achilles, patellar tendon)</li> <li>Plantar fasciitis (pain at located on the bottom of your foot a the front of your heel, especially painful

with 1<sup>st</sup> steps)</li> <li>Medial tibial stress syndrome (i.e., shin splints)</li> <li>Bursitis</li> <li>Stress fracture</li> <li>Low back injury</li> </ul> </li> </ul> Is Selected Or Which of the following musculoskeletal injuries did you sustain as a NCAA athlete. (Please only consider injuries sustained during your NCAA athletic participation, not the years following your NCA... Both acute and chronic Is Selected

I5 Recalling the most significant or debilitating chronic injury that required you to miss at least one day of participation and symptoms persisted 3 months or longer, can you please indicate what type of injury it was? (No participation indicates no type of practice of competition, only rehabilitation or treatment.) Please list most severe injury first. Most severe would be the one that required the largest amount of participation lost or the most painful symptoms.

Tendonopathy (e.g. Achilles tendinitis, jumpers knee) (1)
Plantar fasciitis (e.g. arch pain/tightness) (2)
Medial tibial stress syndrome (e.g. shin splints) (3)
Bursitis (4)
Low back injury (5)
Stress fracture (6)
Other- please specify (7) _____

I6 Overall, how likely were you to participate while injured? (Assuming you were not being held out by a physician or athletic trainer)

Always participated while injured (1)
Often participated while injured regardless of pain (2)
Likely to participate while injured if pain was manageable (3)
Only participated when injury fully healed or primarily pain free (4)

Condition: Only participated when inju... Is Selected. Skip To: Did your NCAA career end due to an in....

I7 If you did participate while injured, which reason below best explains why?

Personal drive to participate (1)
Pressure from coaches (2)
Pressure from teammates (3)
Close to an important meet (4)
Was able to manage pain/symptoms in order to participate (5)
Other- please specify (6) _____

I8 Did your NCAA career end due to an injury?

Yes (1)
No (0)

I9 As a result of your NCAA career related injuries, how much do you perceive

your current physical activity to be limited?

Not limited (3)
Slightly limited (2)
Extremely limited (1)
Not able to function (0)

SF1 In general, would you say your health is:

Excellent (1)
Very good (2)
Good (3)
Fair (4)
Poor (5)

SF2 Compared to one year ago, how would you rate your health in general now?

Much better now than one year ago (1)
Somewhat better now than one year ago (2)
About the same (3)
Somewhat worse now than on year ago (4)
Much worse now than one year ago (5)

SF3 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports (1) | | | |

SF4 The following items are about activities you might do during a typical day.

Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf (1) | | | |

SF5 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Lifting or carrying groceries (1) | | | |

SF6 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Climbing several flights of stairs (1) | | | |

SF7 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Climbing one flight of stairs (1) | | | |

SF8 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Bending, kneeling, or stooping (1) | | | |

SF9 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Walking more than a mile (1) | | | |

SF10 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Walking several blocks (1) | | | |

SF11 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Walking one block (1) | | | |

SF12 The following items are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much?

| | Yes, limited a lot (1) | Yes, limited a little (2) | No, not limited at all (3) |
|---|---|---|---|
| Bathing or dressing yourself (1) | | | |

SF13 During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

| | Yes (1) | No (2) |
|---|---|---|
| Cut down the amount of time you spent on work or other activities (1) | | |

SF14 During the past 4 weeks, have you had any of the following problems with

your work or other regular daily activities as a result of your physical health?

| | Yes (1) | No (2) |
|---|---|---|
| Accomplished less than you would like (1) | | |

SF15 During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

| | Yes (1) | No (2) |
|---|---|---|
| Were limited in the kind of work or other activities (1) | | |

SF16 During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

| | Yes (1) | No (2) |
|---|---|---|
| Had difficulty performing the work or other activities (for example, it took extra effort) (1) | | |

SF17 During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

| | Yes (1) | No (2) |
|---|---|---|
| Cut down the amount of time you spent on work or other activities (1) | | |

SF18 During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

| | Yes (1) | No (2) |
|---|---|---|
| Accomplished less than you would like (1) | | |

SF19 During the past 4 weeks, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems

(such as feeling depressed or anxious)?

| | Yes (1) | No (2) |
|---|---|---|
| Didn't do work or other activities as carefully as usual (1) | | |

SF20 During the past 4 weeks, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?

Not at all (1)
Slightly (2)
Moderately (3)
Quite a bit (4)
Extremely (5)

SF21 How much bodily pain have you had during the past 4 weeks?

None (1)
Very mild (2)
Mild (3)
Moderate (4)
Severe (5)
Very severe (6)

SF22 During the past 4 weeks, how much did pain interfere with your normal work (including both work outside the home and housework)?

Not at all (1)
A little bit (2)
Moderately (3)
Quite a bit (4)
Extremely (5)

SF23 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the

past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Did you feel full of pep? (1) | | | | | | |

SF24 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Have you been a very nervous person? (1) | | | | | | |

SF25 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Have you felt so down in the dumps that nothing could cheer you up? (1) | | | | | | |

SF26 These questions are about how you feel and how things have been with

you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Have you felt calm and peaceful? (1) | | | | | | |

SF27 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Did you have a lot of energy? (1) | | | | | | |

SF28 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Have you felt downhearted and blue? (1) | | | | | | |

SF29 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the

past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Did you feel worn out? (1) | | | | | | |

SF30 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Have you been a happy person? (1) | | | | | | |

SF31 These questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.How much of the time during the past 4 weeks...

| | All of the time (1) | Most of the time (2) | A good bit of the time (3) | Some of the time (4) | A little of the time (5) | None of the time (6) |
|---|---|---|---|---|---|---|
| Did you feel tired? (1) | | | | | | |

SF32 During the past 4 weeks, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting with friends, relatives, etc.)?

All of the time (1)
Most of the time (2)
Some of the time (3)
A little of the time (4)
None of the time (5)

SF33 How TRUE or FALSE is each of the following statements for you.

| | Definitely true (1) | Mostly true (2) | Don't know (3) | Mostly false (4) | Definitely false (5) |
|---|---|---|---|---|---|
| I seem to get sick a little easier than other people (1) | | | | | |

SF34 How TRUE or FALSE is each of the following statements for you.

| | Definitely true (1) | Mostly true (2) | Don't know (3) | Mostly false (4) | Definitely false (5) |
|---|---|---|---|---|---|
| I am as healthy as anybody I know (1) | | | | | |

SF35 How TRUE or FALSE is each of the following statements for you.

| | Definitely true (1) | Mostly true (2) | Don't know (3) | Mostly false (4) | Definitely false (5) |
|---|---|---|---|---|---|
| I expect my health to get worse (1) | | | | | |

SF36 How TRUE or FALSE is each of the following statements for you.

| | Definitely true (1) | Mostly true (2) | Don't know (3) | Mostly false (4) | Definitely false (5) |
|---|---|---|---|---|---|
| My health is excellent (1) | | | | | |

L1 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are

currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Any of your usual work, housework, or school activities (1) | | | | | |

L2 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Your usual hobbies, recreational or sporting activities (1) | | | | | |

L3 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Getting into or out of the bath (1) | | | | | |

L4 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are

currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Walking between rooms (1) | | | | | |

L5 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Putting on your shoes or socks (1) | | | | | |

L6 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Squatting (1) | | | | | |

L7 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are

currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Lifting an object, like a bag of groceries from the floor (1) | | | | | |

L8 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Performing light activities around your home (1) | | | | | |

L9 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Performing heavy activities around your home (1) | | | | | |

L10 We are interested in knowing whether you are having any difficulty at all with

the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Getting into or out of your car (1) | | | | | |

L11 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Walking 2 blocks (1) | | | | | |

L12 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Walking a mile (1) | | | | | |

L13 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are

currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Going up or down 10 stairs (about 1 flight of stairs) (1) | | | | | |

L14 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Standing for 1 hour (1) | | | | | |

L15 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Sitting for 1 hour (1) | | | | | |

L16 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are

currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Running on even ground (1) | | | | | |

L17 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Running on uneven ground (1) | | | | | |

L18 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Making sharp turns while running fast (1) | | | | | |

L19 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are

currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Hopping (1) | | | | | |

L20 We are interested in knowing whether you are having any difficulty at all with the activities listed below because of your lower limb problem for which you are currently seeking attention. Please provide an answer for each activity.

| | Extreme difficulty or unable to perform activity (0) | Quite a bit of difficulty (1) | Moderate difficulty (2) | A little bit of difficulty (3) | No difficulty (4) |
|---|---|---|---|---|---|
| Rolling over in bed (1) | | | | | |

# APPENDIX H: OPTUM METRIC HEALTH OUTCOMES SCORING SOFTWARE LICENSE

## LICENSE AGREEMENT - DETAILS

Licensee: Texas State University
Kimberly Panilla
1850 Aquarena Springs
Apt. 1034 Dr.
San Marcos, TX 78666

License Number: QM039275
Amendment to: N/A
Study Term: 02/28/17 to 02/27/18
Master License Term: N/A
Study Name: Effects of Chronic Lower Extremity
Protocol:
Govt. ID:
Study Type: Thesis/Dissertation
Clients Reference:

Approved Purpose
Effects of Chronic Lower Extremity Injury on Health Related Quality of Life in Current and Former Division 1 Track and Field Athletes

**Licensed Surveys (Modes) and Services:**

| Item | Description | Mode of Admin | Quantity | Fees |
|---|---|---|---|---|
| PROJ01 | License Fee | | 1 | |
| ES0220 | SF-36v2, Standard Recall | Paper or 3rd Party Online | 1 | |
| | **Approved Languages:** United States (English) *Waiving Scientific Form Review for online admin | | | |
| ADM012 | Patients Enrolled (*increments of 100) | | 120 | |
| ADMINS | Administrations (120 x 1 admin*) | | 200 | |
| SS100 | Scoring Software v5 | | 1 | |
| SS108 | SF-36v2: scoring credits v5.0 | | 200 | |
| SS997 | MSE: Missing Score Estimator | | 200 | |
| SS996 | DQE: Data Quality Evaluator | | 200 | |
| SS999 | RCI: Response Consistence Index | | 200 | |
| EM125 | SF-36v2 User's Manual 3rd Ed. | | 1 | |
| | **Approved Languages:** United States (English) | | | |
| EM127 | SF-36v2 Quick Start Guide | | 1 | |
| | **Approved Languages:** United States (English) | | | |