PRECURE Insight

Tennis elbow pain patterns

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Introduction

Lateral elbow pain is one of the most common sources of medical consultation for nontraumatic elbow disorders. Despite its relatively high prevalence, science has no clear answer on how this chronic pain condition develops. The most common clinical diagnosis for this pain is lateral epicondylitis, commonly known as tennis elbow. Nowadays, health and safety professionals are convinced that the best solution for this injury is prevention. Following the idea of preventing tennis elbow to develop, this article aims to reveal some of the factors involved in lateral elbow pain.

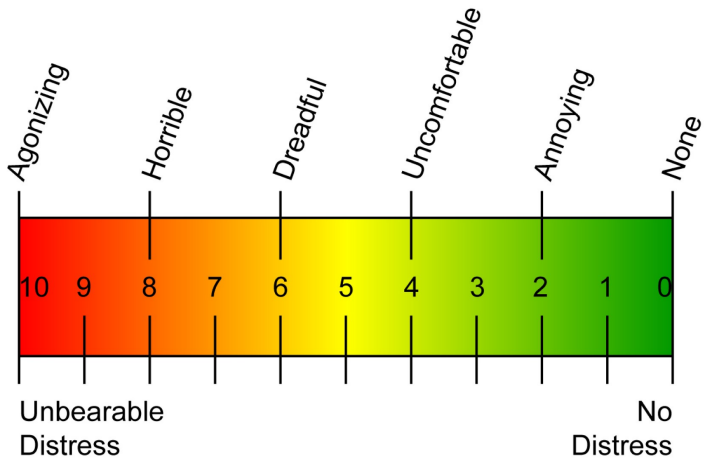

Figure 1: VAS for pain assessment (Tsair-Fwu Lee et al. 2015)

Materials and methods

The survey

A survey was conducted among people suffering from tennis elbow. The target population comprised 124 international participants from different "Tennis elbow pain relief" Facebook groups, 29 men and 95 women. The main emphasis was to obtain the regular lateral elbow pain level perceived by the participants in their daily life. They were asked to report pain on the widely used Visual Analog Scale (VAS) for clinical diagnosis (Figure 1). In addition, a set of individual attributes were collected as candidates for pain level factors, these are: gender, age, work activity, fitness condition, physical activity, smoking history, vascular disorders, diabetes and pain typology.

Statistical analysis

The statistical method used to analyse the survey data was an analysis of the variance (ANOVA) implemented by linear regression model from the statistical software R [1]. Correlation between input variables was also tested out and imbalanced categories were revised in order to avoid wrong results due to data sparsity.

Results and discussion

First of all, it is important to understand that pain level in tennis elbow is an explanatory measurement of the severity of the injury condition. For example, an individual with advanced deterioration of the elbow tendons tends to perceive higher pain levels than an individual with light tendons distress. However, pain level perception and injury severity can not be considered directly correlated since pain level reporting is subjective and can be influenced by a variety of variables, such as genetic or socio-cultural factors [2].

Individual attributes

Next, each individual attribute is discussed in order to provide a useful insight.

Gender Women reported up to a 16% higher pain level than men (Figure 2). This fact is supported by E. J. Bartley's research [3] about sex differences in pain. However, in this study, the 76% women participation in the survey indicates more injury prevalence in them, and therefore, a higher likelihood to reach a more sever tennis elbow condition, which also implies higher pain levels.

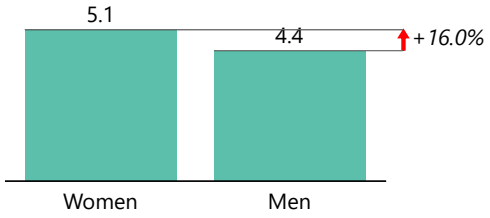

Figure 2: Pain level by gender

Age No clear pattern is observed (Figure 3). However, age between 50 and 55 years old present the higher pain level.

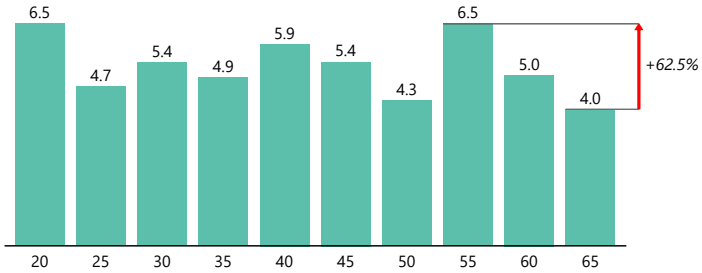

Figure 3: Pain level by age

Vascular disease There is evidence that vascular diseases play a role in the initiation or progression of joints disorders [4]. People with a vascular disease present a reduced blood flow in the joints slowing tissues healing and, therefore, leading to higher pain levels as seen in Figure 4.

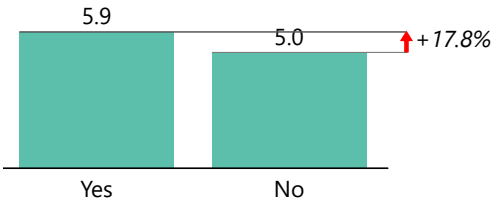

Figure 4: Pain level by presence of vascular disease

Diabetes is proved to be associated with widespread symptoms and complications in joints health [5] [6]. In this study, individuals with diabetes perceived 13,4% more pain (Figure 5).

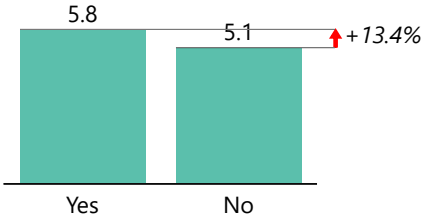

Figure 5: Pain level by diabetes

Smoking history Smoking alters your pain awareness and can hinder body's circulatory system preventing nutrients from flowing to the joints (elbow) [7] [8]. Survey results supported this fact (Figure 6).

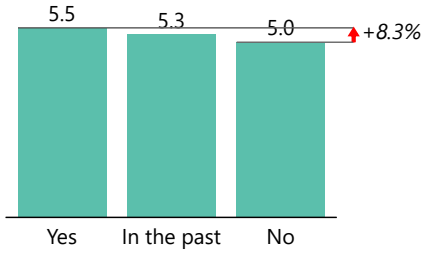

Figure 6: Pain level by smoking history

Fitness condition Contrary to the expected, being in better fitness condition doesn't prevent from pain (Figure 7). That is the case of sports like climbing, kayaking or tennis, where elbow tendons tend to adapt to new loads at slower pace than muscles.

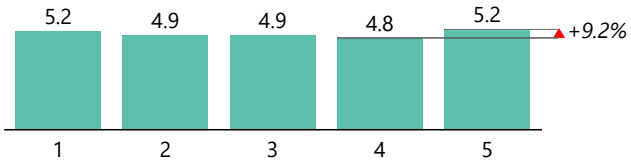

Figure 7: Pain level by fitness condition (5 most fit)

Physical activity Contrary to intuition, both very and barely active participants present higher and similar pain levels while medium activity levels (pretty and somewhat) present lower pain (Figure 8). Therefore, activate your body is beneficial to boost the blood flow within the elbow joint but not resting enough may lead to tendons deterioration. A balance between rest and activity is the right solution.

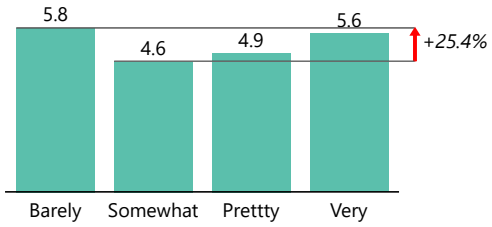

Figure 8: Pain level by physical activity. Barely (less 2h a week), Somewhat (2-4h light activity), Pretty (>4h light activity or 2-4h hard activity), Very (>4h hard activity)

Pain typology Two different pain types are described by injured individuals, one is sharp and characteristic of bad postures and gripping actions while the other is gradual and appears mainly due to tendon fatigue. Even though the evident differences, the average reported pain is equal between them (Figure 9).

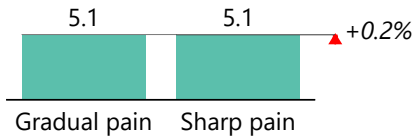

Figure 9: Pain level by pain typology

Work activity presents differences in regular pain (Figure 10), however, each activity represent multiple industrial sub-activities that might yield different results if studied separately. In particular, the use of computers, high repetitive work, and hard physical activities are related to bad habits, fatigue and high loads, respectively, as a cause of higher pain.

Significant factors for pain level

In this section, an analysis of variance (ANOVA) is used to understand whether reported pain levels in the survey differ based on the previous individual attributes. Using this approach, a linear model is fitted to data, it is shown in Listings 1. The stars next to the model coefficients indicate that the variable is significant. Therefore, gender, vascular disease and physical activity play an important role in pain level. These results also support what has been seen in the charts of the previous section. For example, the significant variable Activity.Q (Quadratic) describes the parabolic tendency seen in Figure 8. Other variables like smoking history or diabetes don't appear in the model because their effect in pain level is not notorious enough, nevertheless, they can not be disregarded since they affect the blood flow within the joints as vascular disease does.

Listing 1: Linear regression model for pain level

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Linear Model: Pain ~ Activity + Vascular + Gender

Coefficients:
            Estimate Std. Error t value Pr(>|t|)
(Intercept)  6.31670    0.12276  51.457  < 2e-16 ***
Activity.L   0.03337    0.22803   0.146  0.88374
Activity.Q   0.86487    0.21069   4.105 4.99e-05 ***
Activity.C  -0.34465    0.19033  -1.811  0.07098 .
Vascular     0.99686    0.30557   3.262  0.00121 **
GenderMale  -0.70271    0.23552  -2.984  0.00304 **
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Conclusion

This study has revealed vascular disease, gender and physical activity as significant contributors for tennis elbow pain. Moreover, conditions that affect a proper blood flow within the elbow joint like smoking, diabetes and vascular diseases have presented similar results to previous research. Fitness condition, age, work activity and pain typology have not shown clear patterns regarding pain level.

References

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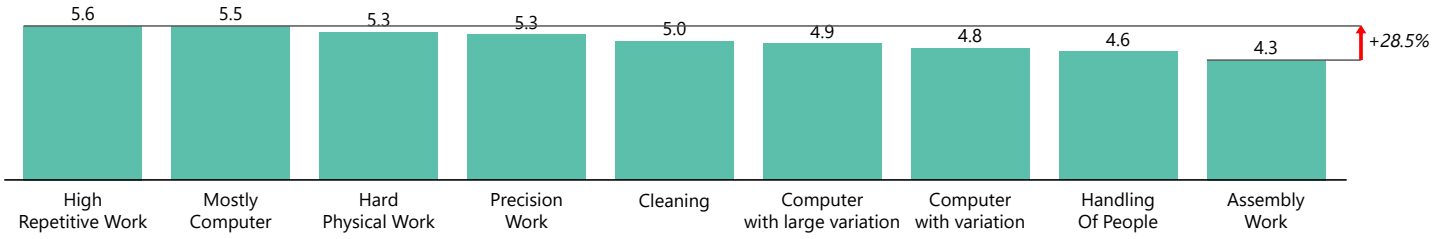

Figure 10: Pain level by work activity