

Research Paper

The Prevalence of Musculoskeletal Injuries in Tennis Players: A Case Study

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Graduation ceremonies offer a good opportunity to take a look back, reflect, and then look forward with passion and purpose.

Abstract

Tennis is a popular sport both globally and locally. It is characterised by repeated strokes and explosive movements, which places the athlete at a high – risk of injuries. This study aimed at gathering data on the prevalence of tennis-related musculoskeletal injuries and injury characteristics from a local Maltese tennis club and analyse the impact of using different injury definitions on the number of collected injuries. Through this case study, an adapted version of the OSTRC questionnaire was distributed via email to members of one Maltese amateur tennis club. Using the ‘all physical complaints’ injury definition data on the prevalence and characteristics of musculoskeletal injuries suffered in the previous 6 months was gathered. Results were then analysed via SPSS and Microsoft Office Excel. A total of 61 injuries from 106 participants were recorded, with a point prevalence of 57.5%. 11 out of these 61 injuries were ‘time-loss’ injuries, and 33 were substantial injuries. The most injured locations were the elbow, knee, and ankle. Gradual onset were the most common, with most of them occurring in the elbow (41%). The ankle was mostly

impacted by sudden onset injuries (36.3%). Following injury severity calculations, sudden onset injuries to the thigh and gradual onset injuries to the elbow and knee were the most burdensome. Through this study, an overview of injury prevalence and awareness from a small group of tennis players from one club has been obtained, setting recommendations for a local wide scale study to investigate the total population prevalence, information which will provide more insight for physiotherapists to help with injury prevention programmes, especially focusing on the elbow and knee, seeing that both were most frequently recorded and most burdensome.

Keywords: *prevalence, injury prevention, musculoskeletal injuries, tennis, gradual onset injuries, sudden onset injuries.*

1. Introduction

Tennis is a well-practised sport, with over 87 million tennis players world-wide, of which 59% are male and 41% are female (ITF Global Tennis Report, 2022). Throughout the years, tennis has been one of the leading sports in Malta, with Maltese players participating in the Small Nations Games (Malta Tennis Federation, 2022).

Tennis players, much like other athletes, are at risk of injury, since this sport is characterised by the dynamic exchange of high-velocity arm movements, overhead manoeuvres, and rapid changes in direction (Patel et al., 2020). In contrast to other sports, tennis does not have a pre-determined time of play, with one match possibly lasting a few minutes to several hours. Consequently, this potential long period of play results in repetitive stresses on the body, due to the involvement of repetitive short bursts of movement. In a study by Humphrey et al. (2019), 662 injuries were recorded from 485 questionnaires

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which were sent to players, ones which were categorised according to anatomical locations and specific tissue structures. The five most injured locations were the elbow (15.6%), knee (11.6%), face (10.0%), lower leg (8.8%) and shoulder (8.2%). In another study conducted amongst tennis players of various skill levels, Acquaye et al., (2020) recorded 170 injuries from a population of 142 athletes, with the knee (27.5%) being the most injured location, followed by the shoulder (21.1%). Despite the difference, the patterns of injury locations were still evident and of similar conclusions. Galea and Hili (1995) concluded that the most common anatomical locations injured were the shoulder and arm (20.59%) with a high frequency at the elbow, followed by the ankle (17.65%). However, this study made use of a small sample of 11 participants. This shows the need for more detailed and larger sampling populations to understand more accurately the trends amongst the local tennis players. Pluim et al (2006) through a consensus statement on injury surveillance for tennis, stated that the incidence, severity, and nature of injuries reported in tennis varies between studies, with the main reason being the variation in definitions related to injuries. This consensus statement recommends more studies are analysed as per definitions listed by Pluim et al (2006) to allow for more comparison of findings.

The aim of this investigation was to understand the prevalence and characteristics of musculoskeletal injuries amongst amateur local tennis players.

2. Methodology

Since this study investigated one tennis club, this paper therefore reports outcomes from a case study quantitative research design.

2.1. Sample Characteristics

Three hundred and fifty-eight (358) questionnaires were sent via email to club members through an intermediary. Participants were selected if they met the following inclusion criteria: (i) participants had to be above the age of 18 years, (ii) had to be members of the club and, (iii) practiced the sport at least once per week, to differentiate between recreational members and amateur tennis players. The exclusion criteria included any (i) tennis club member of the age 17 years or younger, (ii) tennis players forming part of other tennis clubs and, (iii) members who did not practice tennis for more than once per week.

2.2. Data Collection

The Oslo Sports Trauma Research Centre (OSTRC) injury questionnaire (Clarsen et al., 2014; 2020) was used for data collection. It is a reliable method of injury surveillance (Clarsen et al., 2020, Jorgensen et al., 2016), reported to produce accurate results. The positive response to using such a questionnaire was seen in a variety of sports, including handball (Andersson et al., 2016), football (Girdwood et al., 2021) and basketball (Hannington et al., 2021). The questionnaire includes four key questions on injury consequences based on sports participation, sport training volume, sports performance, and the perceived pain of the injury by the athlete. It allows for an in-depth surveillance of sports injuries, measuring the severity of the injury, injury characteristics, and functional consequences of the injury. (Clarsen et al., 2020). A musculoskeletal injury was defined as “any physical complaint resulting from relevant sports participation regardless of its consequences” (Clarsen & Bahr 2014).

All participants were provided with an online link to the questionnaire in the information letter which was distributed to the members by the intermediary. Reminders were sent by the intermediary after the first and second week. Furthermore, the link was active for a total of 2 months. This was done to maximise the response and gain more data from the local tennis club members.

2.3. Ethical Permissions

Ethical permission were obtained from the Faculty of Research Ethics Committee (FREC) and by the University Research Ethics Committee (UREC) FHS-2022-00086. Consent was also obtained for use of the OSTRC questionnaire by one of the authors of this questionnaire.

2.4. Data Analysis

The data gathered was analysed using the Statistical Package for Social Sciences (SPSS, Version 28) and Microsoft Excel software (version 16.69.1). Bar charts and tables were formulated, to interpret patterns and trends. Categorical data were represented as percentages and frequencies. These were then analysed through descriptive methods and inferential analysis. The Shapiro Wilk test was used to check for normality of the data. The Mann-Whitney U test was computed to analyse the difference between the nature of injury and severity scoring. The Pearson chi-squared test was

computed to investigate any significant associations between the categorical variables, these being the level of participation following an injury and the nature of injury.

3. Results

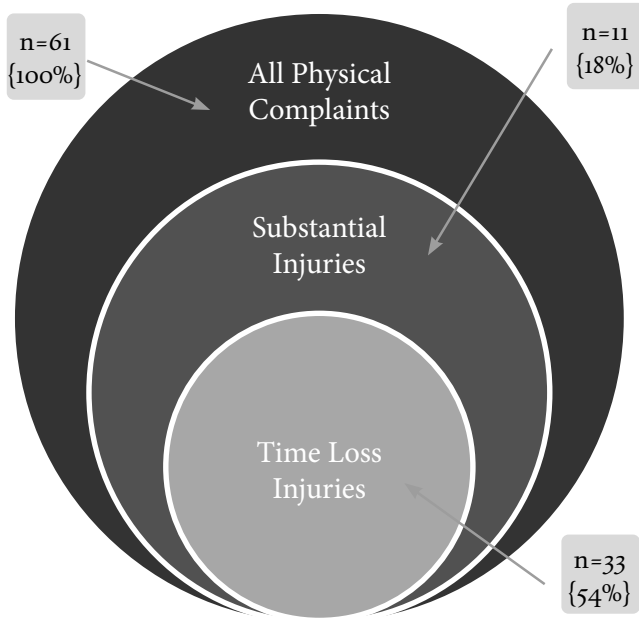
From 358 questionnaires that were distributed, 106 responded, making the response rate that of 29.8%. From the study population (N=106), 60 participants were female and 46 were male. Further participant characteristics is provided in Table 1.

Table 1: Table demonstrating demographic data.

		Total	
		Frequency (n)	Percentage (%)
Age	Between 18–19 years	23	21.7%
	Between 30–44 years	38	35.8%
	Between 45–59 years	34	32.1%
	50 years or older	11	10.4%
Gender	Male	46	43.4%
	Female	60	56.6%
	Other	0	0.0%
Tennis experience	Less than a year	8	7.5%
	Between 1–4 years	24	22.6%
	More than 5 years	74	69.8%
Training frequency	1–2 times a week	76	71.7%
	3 times a week	18	17.0%
	More than 3 times a week	12	11.3%
	week		
Training duration	Less than 1 hour	0	0.0%
	1 hour	31	25.4%
	More than 1 hour	61	50.0%
	Varies	14	11.5%
Participation in tournaments/competitions	Yes	80	75.5%
	No	26	24.5%
Tournaments/competitions frequency	Once per year	9	11.3%
	Once every 6 months	17	21.3%
	Frequently	54	67.5%

When analysing the number of injuries recorded by these 106 participants, one which amounted to 61 injuries, one could observe more athletes reporting injuries when using the “all physical complaints” definition, when compared to the number of injuries captured when using the “time-loss” definition which resulted in a total of 11 injuries only being recorded. Additionally, approximately half of the injuries captured from this group of tennis players were substantial injuries (n=33).

From these 61 injuries, less than half (42.5%, n=45) reported at least one injury which was sustained in the previous 6 months. The rest of the participants reported no injuries 6 months prior to data collection. From the 45 participants who reported an injury, 13 (28.9%) recorded the presence of 2 injuries, and 3 participants (6.7%) recorded the presence of 3 injuries in the previous 6 months.



Injuries which were classified as gradual-onset injuries (injuries which are caused due to repetitive movements or overuse) resulted to be the most common, accounting to 63.9% (n=39) in these participants, while 36.1% (n=22) were classified as sudden-onset (acute) in nature. The incidence of sudden-onset injuries was mostly noted to occur during a training session or during a tennis match, however, the players which were studied reported that tennis as an activity was not the only mechanism of their injuries. 22 injuries which were classified as sudden-onset injuries occurred during an activity other than tennis (n=9) (Figure 2). Sudden onset injuries were mostly prevalent in the lower limbs, with the ankle having the highest frequency (36.3%), followed by the knee (18.2%) (Figure 3).

Figure 1: Venn diagram demonstrating injuries according to the injury definitions

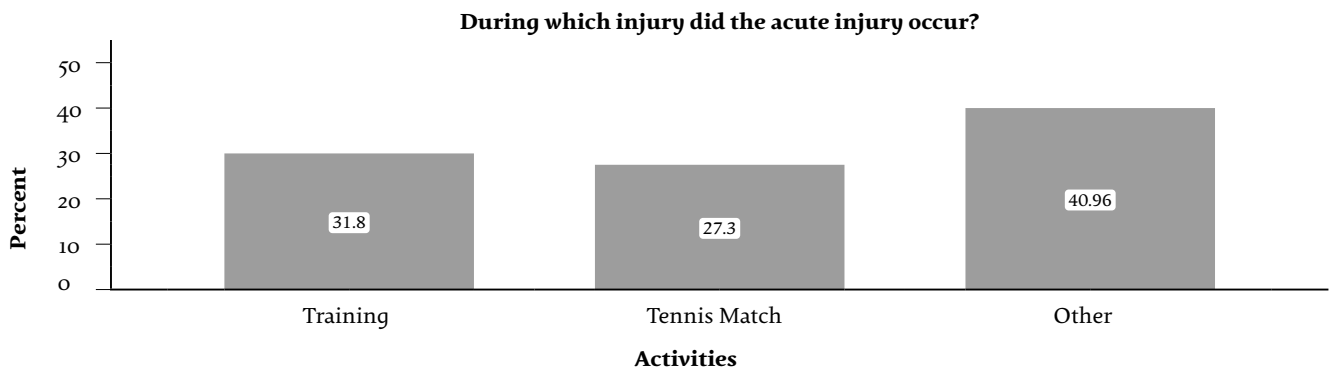


Figure2: Bar chart demonstrating acute injury occurrence

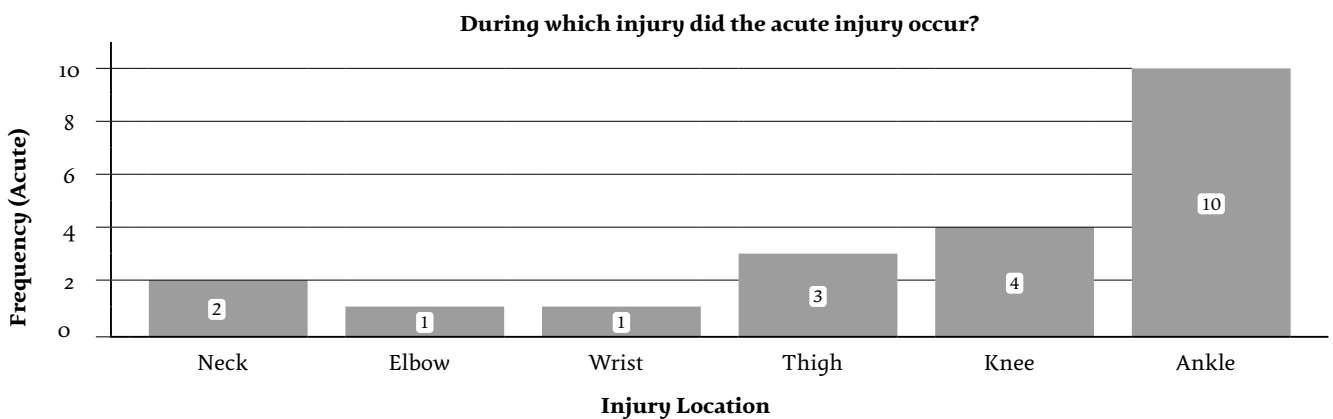


Figure 3: Bar chart demonstrating locations in sudden-onset injuries

Analysis of injuries which were classified as gradual onset (overuse) injuries were noted to be mostly prevalent for participants in this study in the upper

limbs, specifically in the elbow (41%), followed by the knee (23%) as can be observed in Figure 4.

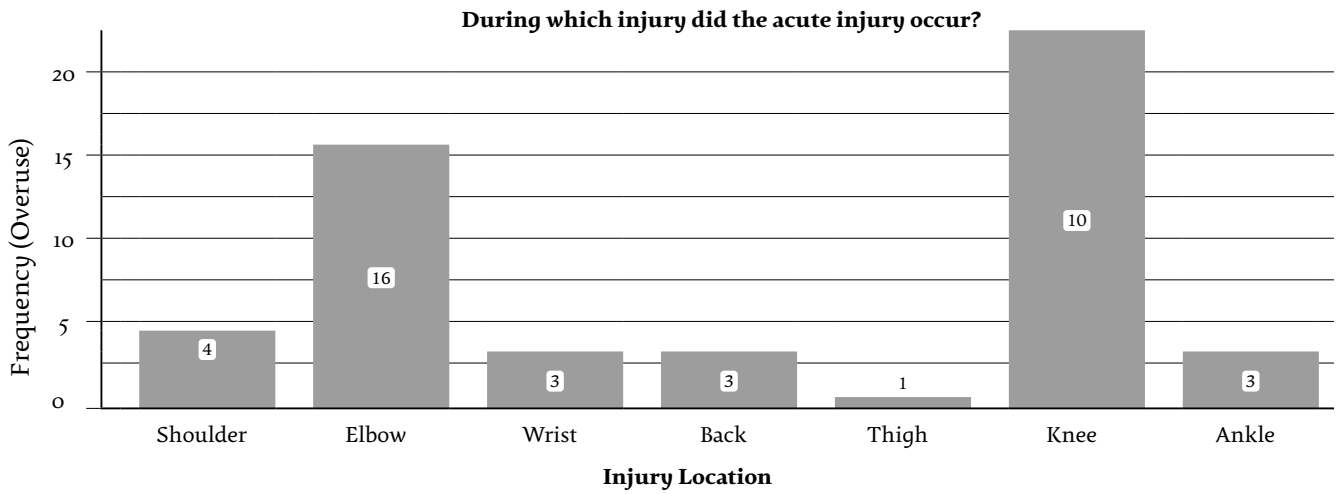


Figure 4: Bar chart demonstrating injury locations in gradual-onset injuries

In these participants, one can note that injuries which were classified as gradual-onset injuries, allowed for the continuation of participation in the sport (59%), whereas injuries which were classified as sudden-onset injuries tended to result in reduced participation in the sport (45.5%), findings which although close, were not statistically significant ($\chi^2(2) = 5.818, p = 0.055$). The median severity scoring for both sudden (n=22) and gradual-onset

(n=39) injuries was of 50/100. No significant differences between the two variables were noted ($p = 0.745$). The minimum severity scoring of overuse injuries was 8/100 and the maximum was 100/100, with interquartile range of 35. On the other hand, the minimum severity scoring of acute injuries was 16/100 and the maximum was 100/100, with interquartile range of 67.

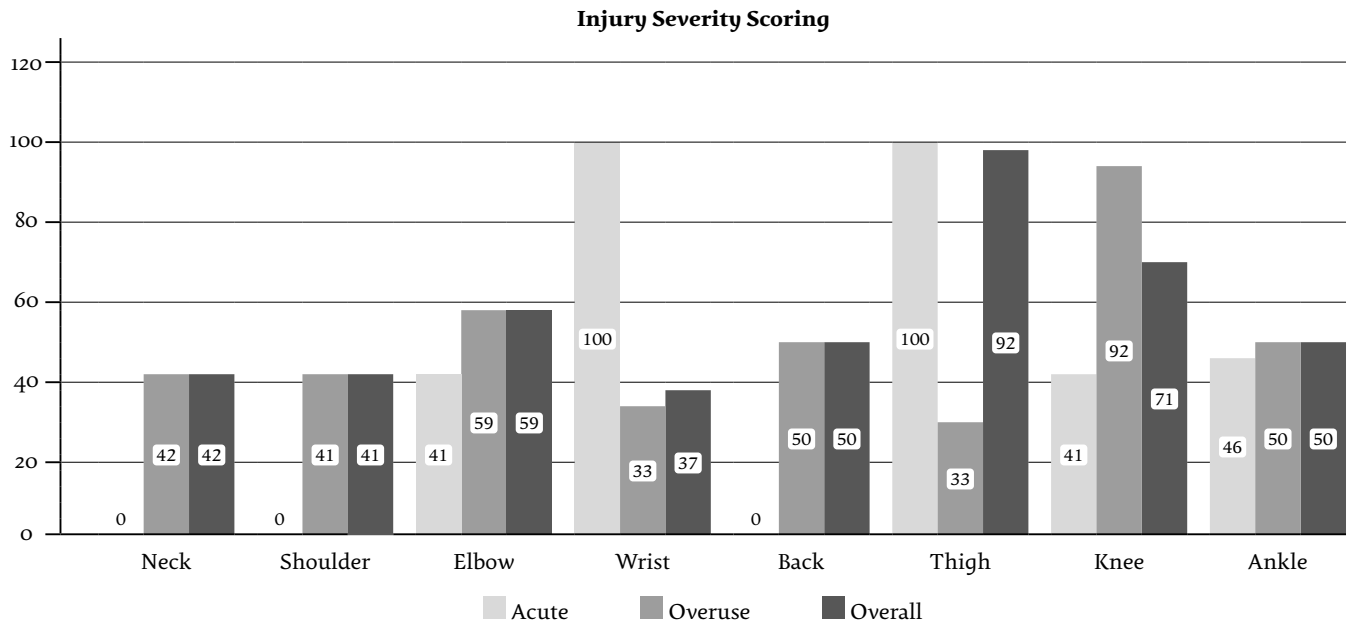


Figure 5: Bar chart demonstrating the median injury severity scores of all body locations in relation to the nature of injury

This comparison showed that the most severe sudden-onset injuries in these tennis players investigated during this study were located at the wrist (n=1) and thigh (n=3), both having a severity score of 100/100, while the most severe overuse injuries were in the knee (n=9) with a severity score of 92/100 and elbow 59/100. The overall severely injured location was the thigh (n=4) (Figure 5).

4. Discussion

The purpose of this research study was to gather an understanding of the prevalence of musculoskeletal injuries among tennis players from one local tennis club.

Analysis of injuries through the 'all physical complaints' injury definition resulted in 61 injuries captured. This is higher than the number of injuries captured via substantial and time-loss injury definitions. The all-physical complaints definition captures athletes who can still participate in the sport even with the presence of an injury. The degree of is continual participation reported by these players despite their injury follows trends reported in a study by Bolling et al (2019), who reports that an injury was not defined according to symptoms, nor based on limitation in participation but rather according to the effect it has on the athlete's performance. Therefore, this finding shows that the physical problem was only perceived as an injury once it hampered the performance of the athlete.

Analysing injuries classified as being substantial in nature, due to the moderate or severe reduction in training time, moderate or severe reduction in performance, or the inability to participate (Clarsen et al., 2013), resulted in 54% (n=33) of all reported injuries. This finding from these tennis players of this club is higher than that reported in an epidemiological study on five different sports by Clarsen et al (2013), with 13% of all physical complaints found to be substantial makes the players of this club to be at a higher risk of developing such type of injuries. This calls for a large-scale study on all local tennis players of all clubs to analyse and emphasis on the need and importance of having an injury surveillance programme in this sporting context. Such a programme is essential as it allows for athletes of which ever level of performance to have their injuries seen to immediately, preventing worsening of symptoms and allowing these to become substantial injuries, ones which might not only influence training and competitions but may also limit performance of daily activities.

Through the time-loss injury definition – an injury which results in time away from the sporting activity – only a small number of injuries were captured (n=11/61) from this cohort, namely the most severe ones. This shows that 50 out of the 61 injuries reported by these athletes did not interfere with continuation of tennis participation. Findings from this cohort, which represents only one local tennis club is concerning, as one can note that many athletes continue to participate in the sport irrespective of the injury sustained. When an athlete participates with the presence of an injury, the athlete may consequently impose health risks. Bekker et al (2020) did report that players tend to accept the consequences of their injuries and continue to play. Therefore, further investigations of the prevalence of injuries in the local population of tennis players is required so identify the extent of this finding from this study and if this trend persists, the importance and need for athlete education on injury prevention and management are to be emphasised on.

4.1. Sudden vs Gradual Onset Injuries

The results of this study also bring out that gradual onset injuries in this group of amateur tennis players were the most common type, amounting to 63.4% of the injuries, probably ones related to the number of repetitive movements involved (Acquaye et al., 2020 and Clarsen et al., 2013). One needs to note that a possibility exists that since the participants being investigated were amateur players, their technique might not be precise as that of professional players, increasing the likelihood of having improper techniques. Comparison of these findings of this study to those by Pluim et al (2006), one can note a high incidence of sudden onset injuries reported by these authors, with four out of six studies reporting more sudden onset injuries rather than gradual onset injuries. Factors which might contribute to this include the prospective study design used by Pluim et al. (2006) which might have captured more injuries as opposed to retrospective analysis as happened in this study. Additionally, this difference may also be due to the different injury definitions being used, with three studies capturing injuries requiring medical attention and one capturing time loss injuries. The sample size and distribution of the study also needs to be taken into consideration, keeping in mind that our study investigates a small cohort of participants from one club.

Sudden-onset injuries occurring during training and matches were of similar low frequencies, even though different physical levels during these activities are

required. A suggestive finding was that most sudden onset injuries did not occur during training or competition amongst amateur players, but during other activities (40.9%). One can appreciate that amateur athletes have other commitments outside of training, including work or the possibility of participating in another sport, in contrast with professional tennis players. Over here, the concept of an athlete-centered approach is thus crucial as it moves away from a 'one-size fits all' towards an individualised injury prevention and management, which takes into consideration the context of the athlete (Bolling et al., 2019)

Comparison of the nature of the injury and the level of participation resulted in a near statistically significant difference. Unlike sudden onset injuries, athletes with gradual-onset injuries tend to continue to participate in training/competition, as symptoms of injury typically develop gradually and are usually transient in nature (Clarsen et al. 2013). This ultimately shows that sudden – onset injuries are more limiting when compared to gradual-onset injuries.

4.2. Location of Injuries

Location of injuries were similar to those reported by Sener et al., (2016), with both studies reporting the highest numbers of injuries occurring in the elbow, knee, and ankle. Our study showed that the elbow was most prone to injury amongst this cohort of tennis players, comprising 27.9% of the injuries, with most injuries within this location being gradual in nature (n=16, 41%). Such findings compared with those reported by Humphrey et al. (2019) and in a local study by Galea and Hili (1995), where it was reported that the most common sites of injury were the shoulder and arm (20.59%), including the elbow. These high number of elbow injuries may be caused by repetitive strokes and incorrect technique or equipment in amateur tennis players (Chung, Lark 2017).

The knee was the second most injured location (23%) which was also seen in previous literature (Acquaye et al., 2020; Humphrey et al., 2019). This high frequency may be due to the combination of side movements and the bending of the knees to reach low-bouncing balls (Humphrey et al., 2019). The ankle was also noted to be another location mostly affected by sudden-onset injuries (n=10, 36.3%). This high number of ankle sudden onset injuries was confirmed once again in the study by Humphrey et al., (2019). A plausible explanation of such

high number of injuries in the ankle (21.3%), could also be due to the excessive side movements (Acquaye et al., 2020) and explosive movements (Humphrey et al., 2019). Injury types as per location resulted in the wrist and thigh being the areas more prone to sudden-onset injuries, resulting in a high severity scoring of 100/100. However, athletes, only reported one and three injuries that affected the wrist and the thigh, respectively.

Analysis of severity scoring of every injury resulted in average severity score of 54/100. This indicates that the participants which were investigated through this study were more likely to sustain injuries of moderate severity. Literature capturing the severity scores of sudden onset and gradual onset injuries, using the OSTRC method in tennis players was not available to the knowledge of the researcher. Therefore, comparison to other literature cannot be made. The highest severity scores in gradual onset injuries were the knee and the elbow. The knee had a scoring of 92/100, followed by the elbow with 59/100. Even though injuries to the elbow, were less severe than knee injuries, injuries at the elbow were more frequent (n=16) than the knee (n=9), thus showing that both locations present a high burden on the athlete. This high severity score of gradual-onset injuries affecting the knee was also recorded in the study conducted by Clarsen et al (2013).

5. Conclusion

This study investigated the prevalence of musculoskeletal injuries amongst tennis players in one local tennis club. From the observations highlighted below, a large-scale study is recommended investigating the incidence of tennis related injuries using a sample which is representative of the Maltese tennis players.

5.1. The following prominent observations were highlighted:

- This study shows that these tennis players had a higher incidence of gradual onset rather than of a sudden onset type of injuries.
- The utilisation of different injury definitions resulted in gathering different amounts of injuries. This showed the superiority of capturing injuries as 'all physical complaints' rather than 'time loss' injuries.
- The thigh, elbow, knee were the most burdensome injuries in terms of severity, with no relation seen

between the nature of the injury and the severity score for these participants.

6. Clinical Importance

The first step in developing injury prevention measures is the gathering of data on the description of the injuries. Such a study is of great interest, especially since there is a dearth of research on the epidemiology of injuries in tennis, both globally (Humphrey et al., 2019) and locally (Galea, Hili 1995). Given this limitation, the need for epidemiological studies is important to further understand the characteristics of tennis injuries and set a basis for the development of evidence-based injury prevention measures. The relevance of this study to the profession of physiotherapy is that it reveals more information on such musculoskeletal injuries, providing essential information to the physiotherapist in managing and preventing tennis-related injuries. Therefore, through findings on the prevalence and common anatomical locations injured, it gives physiotherapists insight into how to plan and prevent such injuries from taking place in the future, decreasing risks of such musculoskeletal injuries amongst athletes, resulting in maximisation of health benefits of the sport.

References

2022. ITF Global Tennis Report. [online] ITF Academy [viewed 15/10/22]. Available from: <https://www.itftennis.com/en/news-and-media/articles/itfglobal-tennis-report-now-available-on-itf-academy/>
- Acquaye, G., Quartey, J. & Kwakye, S., 2020, 'Pattern of injuries amongst tennis players in Accra, Ghana', *South African Journal of Physiotherapy* 76(1), a1429. <https://doi.org/10.4102/sajp.v76i1.1429>
- ANDERSSON, S.H., BAHR, R., CLARSEN, B. and MYKLEBUST, G., 2017. Preventing overuse shoulder injuries among throwing athletes: a cluster randomised controlled trial in 660 elite handball players. *British Journal of Sports Medicine*, Jul, vol. 51, no. 14, pp. 1073–1080. Available from: <http://dx.doi.org/10.1136/bjsports-2016-096226> MEDLINE. ISSN 0306-3674. DOI 10.1136/bjsports-2016-096226
- BEKKER, S., BOLLING, C., HAHMED, O., BADENHORST, M., CARMICHAEL, J., FAGHER, K., et al 2020. Athlete health protection: Why qualitative research matters. *Journal of Science and Medicine in Sport*, Oct 1, vol. 23, no. 10, pp. 898–901. Available from: <https://dx.doi.org/10.1016/j.jsams.2020.06.020> MEDLINE. ISSN 1440-2440. DOI 10.1016/j.jsams.2020.06.020. 64
- BOLLING, C., DELFINO BARBOZA, S., MECHELEN, W. and PASMAN, H.R., 2019. How elite athletes, coaches, and physiotherapists perceive a sports injury. *Translational Sports Medicine*, Jan, vol. 2, no. 1, pp. 17–23. Available from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/tsm2.53> CrossRef. ISSN 2573-8488. DOI 10.1002/tsm2.53
- CHUNG, K.C. and LARK, M.E., 2017. Upper Extremity Injuries in Tennis Players: Diagnosis, Treatment, and Management. *Hand Clinics*, Feb, vol. 33, no. 1, pp. 175–186. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/27886833> MEDLINE. ISSN 0749-0712. DOI 10.1016/j.hcl.2016.08.009
- CLARSEN, B., MYKLEBUST, G. and BAHR, R., 2013. Development and validation of a new method for the registration of overuse injuries in sports injury epidemiology: the Oslo Sports Trauma Research Centre (OSTRC) Overuse Injury Questionnaire. *British Journal of Sports Medicine*, May, vol. 47, no. 8, pp. 495–502. Available from: <http://dx.doi.org/10.1136/bjsports-2012-091524> MEDLINE. ISSN 0306-3674. DOI 10.1136/bjsports-2012-091524
- CLARSEN, B. and BAHR, R., 2014. Matching the choice of injury/illness definition to study setting, purpose and design: one size does not fit all. *British Journal of Sports Medicine*, Apr, vol. 48, no. 7, pp. 510–512. Available from: <http://dx.doi.org/10.1136/bjsports-2013-093297> MEDLINE. ISSN 0306-3674. DOI 10.1136/bjsports-2013-093297
- CLARSEN, B., BAHR, R., MYKLEBUST, G., et al. 2020. Improved reporting of overuse injuries and health problems in sport: an update of the Oslo Sport Trauma Research Center questionnaires. *British Journal of Sports Medicine*, Apr, vol. 54, no. 7, pp. 390–396. Available from: <http://dx.doi.org/10.1136/bjsports-2019-101337> PubMed. ISSN 0306-3674. DOI 10.1136/bjsports-2019-101337
- GALEA, A., HILI J., 1995. Injuries within popular sports in Malta. (Bachelors ed), University of Malta.
- GIRDWOOD, M. and WEBSTER, M., 2021. Quantifying the Burden of Shoulder and Hip Pain In Water Polo Players Across Different Playing Levels. *International Journal of Sports Physical Therapy*, Feb 1, vol. 16, no.

- 1, pp. 57–67. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/33604135> PubMed. ISSN 2159–2896. DOI 10.26603/001c.18801
- HANNINGTON, M., TAIT, T., DOCKING, S., et al. 2021. Prevalence and pain distribution of anterior knee pain in college basketball players. *Journal of Athletic Training*, Jul 1. Available from: <https://search.proquest.com/docview/2556583742> University Readers. ISSN 1062–6050. DOI 10.4085/1062–6050-0604.20
- HUMPHREY, J.A., HUMPHREY, P.P., GREENWOOD, A.S., et al. 2019. Musculoskeletal injuries in real tennis. *Open Access Journal of Sports Medicine*, vol. 10, pp. 81–86. Available from: <https://www.ncbi.nlm.nih.gov/pubmed/31213934> PubMed. ISSN 1179–1543. DOI 10.2147/OAJSM.S198500
- JORGENSEN, J.E., RATHLEFF, C.R., RATHLEFF, M.S. and ANDREASEN, J., 2016. Danish translation and validation of the Oslo Sports Trauma Research Centre questionnaires on overuse injuries and health problems. *Scandinavian Journal of Medicine & Science in Sports*, Dec, vol. 26, no. 12, pp. 1391–1397 CrossRef. ISSN 0905–7188. DOI 10.1111/sms.12590
- PATEL, H., LALA, S., HELFNER, B. and WONG, T.T., 2021. Tennis overuse injuries in the upper extremity. *Skeletal Radiology*, vol. 50, no. 4, pp. 629 – 644. Available from: <https://link.springer.com/article/10.1007/s00256-020-03634-2> PubMed. ISSN 0364–2348. DOI 10.1007/s00256-020-03634-2
- PLUIM, B.M., STAAL, J.B., WINDLER, G.E. and JAYANTHI, N., 2006. Tennis injuries: occurrence, aetiology, and prevention. *British Journal of Sports Medicine*, May, vol. 40, no. 5, pp. 415–423. Available from: <http://dx.doi.org/10.1136/bjism.2005.023184> MEDLINE. ISSN 0306–3674. DOI 10.1136/bjism.2005.023184
- SENER, O.A., CINAR, S. and ZIYLAN, T., 2016. Investigation of the incidence and causes elite tennis players' injuries in Turkey. *Turkish Journal of Sport and Exercise*, Nov 2, vol. 18, no. 2, pp. 76 CrossRef. ISSN 2147–5652. DOI 10.15314/tjse.93600
- Tennis in Malta – A brief history of the Malta Tennis Federation [online] [view 20/11/2022]. Available from: <https://maltatennisfederation.com/history/>