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Injury prevalence and characteristics among tennis coaches in the Netherlands: a cross-sectional survey

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ABSTRACT

Objectives To describe the prevalence and characteristics of injuries among tennis coaches in the Netherlands and examine associations with individual and occupational factors.

Methods In this cross-sectional survey, all 1902 licensed tennis coaches in the Netherlands were invited to complete an online questionnaire. Data were collected on injuries during a 2-year recall period, as well as mental health problems, pain-medication use, healthcare utilisation and work-related characteristics.

Results 900 coaches (74.8% men) completed the survey and 37% reported at least one injury in the previous 2 years. Injuries most frequently affected the lower back (19.5%), shoulder (12.0%), knee (11.6%), neck (7.4%) and elbow (6.2%), with overuse injuries accounting for the largest proportion. Injury prevalence did not differ significantly between male and female coaches. Coaches reporting injuries were taller and had a higher body mass index than uninjured coaches, although differences were small. Approximately one-third of coaches reported that injuries interfered with their ability to teach or play tennis. Pain medication use during tennis instruction was reported by 23% of coaches. Among coaches with health problems, 35% consulted a physiotherapist, 35% a general practitioner and 9% attended an emergency department.

Conclusions Musculoskeletal injuries are common among tennis coaches and most frequently affect the lower back and lower extremities. Many coaches continue teaching despite ongoing injuries and functional complaints, often accompanied by substantial healthcare utilisation and pain medication use. These findings provide insight into the musculoskeletal health burden associated with tennis coaching and highlight the need to include coaches in tennis injury prevention initiatives.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Musculoskeletal injuries are common in tennis players, particularly affecting the lower extremities and upper limbs.
⇒ However, little is known about the prevalence and impact of injuries among tennis coaches, despite their prolonged on-court exposure and repetitive workload.

WHAT THIS STUDY ADDS

⇒ This study provides one of the first large-scale descriptions of injury prevalence among tennis coaches, an occupational group that has received little epidemiological attention.
⇒ More than one-third of tennis coaches reported injuries over a 2-year period, most commonly affecting the lower back, shoulder and knee.
⇒ Injuries frequently interfered with coaching activities and were accompanied by substantial healthcare utilisation and pain medication use.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Tennis coaches may represent an under-recognised occupational risk group for musculoskeletal injuries. Injury prevention initiatives in tennis should therefore include coaches in addition to players.
⇒ Future research should focus on identifying modifiable risk factors and developing targeted prevention strategies for coaching populations.

INTRODUCTION

Tennis is a major international sport with an estimated 106 million participants worldwide.[1] In the Netherlands, it ranks among the largest organised sports, with more than 500 000 registered members of the Royal Dutch Lawn Tennis Association (KNLTB) and over one million people participating regularly, including recreational participants. Following strong growth in recent years, tennis continues to attract participants across youth, adult and veteran age groups, supported by an extensive nationwide club network.

Tennis places substantial physical demands on the body, including repeated sprinting, jumping, rapid directional changes and high forces generated during stroke production.[2] These demands place considerable mechanical load on the musculoskeletal system, particularly affecting the lower extremities, shoulder and lumbar spine.[3–5] Musculoskeletal injuries are common in tennis and have been extensively described in both recreational and professional player populations.[6–10]

Tennis coaches are exposed to many of the same physical demands as players. Coaching typically involves prolonged periods on court, repeated stroke demonstrations, ball feeding and participation in training drills. Although some coaches also compete, coaching work often involves year-round on-court exposure with limited opportunities for structured rest and recovery. As a result, the workload characteristics and biomechanical demands experienced by coaches may differ from those of players.

Despite these demands, research on injuries among tennis coaches remains scarce. To date, only one study has reported on musculoskeletal conditions among tennis-teaching professionals, providing limited insight into injury prevalence and impact.[11] Greater insight into injury patterns and associated occupational factors in tennis coaches is therefore warranted.

The primary aim of this study was to describe the prevalence and characteristics of injuries among tennis coaches in the Netherlands. A secondary aim was to examine associations between injury occurrence and coaches' personal characteristics and working conditions. Improved insight into these factors may support the development of targeted injury prevention strategies and contribute to recognising tennis coaching as a potential occupational risk group.[12]

METHODS

Study design

This cross-sectional survey assessed the prevalence and characteristics of injuries, and associated personal and occupational factors, among tennis coaches in the Netherlands. Data were collected via an online questionnaire administered between 9 April 2021 and 10 May 2021.

Setting

In the Netherlands, more than one million individuals participate in tennis on a regular basis. In 2020, the KNLTB, the national governing body for tennis, represented approximately 1600 affiliated clubs and 567 000 registered tennis players.[13] In the same year, a total of 1902 tennis coaches were licensed by the KNLTB.[13]

Participants

All 1902 licensed tennis coaches (hereafter referred to as 'coaches') registered with the KNLTB in 2020 were eligible for inclusion. Of these, 1455 (76.5%) were male and 447 (23.5%) were female, reflecting the gender distribution of the national coaching workforce. Coaches were invited to participate via email and through the '*Tennisleraren App*'.[14] This application provides Dutch tennis coaches with access to their coaching licence information, continuing education records and registration for refresher courses and additional professional development activities.

Survey

A specifically designed and pilot-tested online questionnaire comprising 69 items was used to collect data on current and previous injuries experienced during the preceding 2 years (see online supplemental files). The questionnaire was pilot tested among a small group of tennis coaches to assess clarity, relevance and comprehensibility, and minor revisions were made based on their feedback before final distribution.

For reported injuries, coaches provided information on anatomical location, treatment received and the type of healthcare professional consulted.

The questionnaire also included a single item on illness or health problems in the preceding 2 years. Because this item did not collect detailed information on illness type, duration or severity in sufficient detail, these outcomes were not analysed further in the present study.

The questionnaire also included items on general health and lifestyle factors, including smoking behaviour, alcohol consumption and psychological complaints experienced during the past year, as well as questions on psychological help-seeking.

Additional data included demographic and anthropometric characteristics (age, sex, height and body mass), coaching-related variables (years of experience, dominant arm, certification/licence level), environmental factors (court surfaces used for coaching during summer and winter; multiple responses possible), and work-related characteristics such as type of employment contract, work-related health complaints, teaching workload and participation in additional occupational activities besides tennis coaching.

Definitions

Coaches were classified as having an injury if they answered 'yes' to the question: *"Did you experience one or more injuries in the past two years that prevented you from teaching tennis and/or for which you consulted a medical professional or physiotherapist?"* This definition was used to identify both current and past injuries within the 2-year recall period.

Mental health problems were defined according to the International Olympic Committee (IOC) consensus guidelines for athlete mental health support.[15] In this framework, a mental health problem refers to any adverse thought, feeling, behaviour or psychosomatic symptom that reduces an individual's normal state of mental health, encompassing a spectrum ranging from minor symptoms to severe mental health disorders. The term 'mental health problems' was therefore used to reflect this broad range of symptoms and conditions.

Data collection and reporting followed the Tennis-specific extension of the IOC consensus statement on methods for recording and reporting epidemiological data on injury and illness in sport (2020), where applicable.[16] Modifications were necessary due to COVID-19-related restrictions, which affected the assessment of time to return to full participation, and because the study population comprised coaches rather than players, rendering recommendations related to match exposure inapplicable.

Statistical analysis

Continuous variables were assessed for distribution using visual inspection of histograms and normal and detrended Q-Q plots. Continuous variables are presented as medians with interquartile ranges (25th–75th percentile), and non-parametric statistical tests were applied. For variables collected in categorical ranges (eg, teaching load), the median and IQR were estimated from the cumulative frequency distribution of the categories. Categorical variables are presented as frequencies (n) and percentages (%).

Injury status (one or more injuries vs no injuries in the preceding 2 years) was used as the grouping variable to compare demographic, anthropometric and occupational characteristics. Differences between groups (sex and injury status) were examined using the Mann-Whitney U test for continuous variables and the χ^2 test for categorical variables. Analyses were conducted for the total population and stratified by sex. Statistical significance was set at $p<0.05$. All analyses were performed using IBM SPSS Statistics, V.27 (IBM).

Patient and public involvement

Patients or members of the public were not involved in the design, conduct, reporting or dissemination plans of this research. Tennis coaches participated as study respondents only. The research question and outcome measures were developed by the research team in collaboration with the national tennis federation, based on perceived occupational health needs within the coaching population.

Reporting of this study followed the Strengthening the Reporting of Observational Studies in Epidemiology guidelines for cross-sectional studies.

RESULTS

A total of 900 coaches (673 men, 226 women and 1 who preferred not to disclose sex) completed the questionnaire, corresponding to a response rate of 47%. Overall estimates include all 900 respondents; sex-stratified analyses were based on the 899 participants who reported sex. Participant characteristics are presented in table 1.

Table 1 Demographic and anthropometric characteristics of coaches, and differences between injured and non-injured coaches

Characteristic	Male (n=673)	Female (n=226)	P value	Overall (n=900)
Age (years)	41.0 (33.0–54.0)	40.0 (31.0–49.0)	0.011	41.0 (32.0–52.0)
Height (m)*†	1.84 (1.80–1.88)	1.71 (1.68–1.75)	<0.001	1.82 (1.75–1.87)
Body weight (kg)*†‡	82.0 (75.0–90.0)	67.0 (61.2–72.0)	<0.001	79.0 (70.0–87.4)
BMI (kg/m^2)*	24.3 (22.7–26.0)	22.5 (21.2–24.2)	<0.001	23.9 (22.2–25.7)
Dominant arm, n (%)			0.031	
Right	584 (86.8)	199 (88.1)		783 (87.0)
Left	89 (13.2)	27 (11.9)		117 (13.0)
Both	0 (0)	0 (0)		0 (0)

Data are presented as median (25th–75th percentile) for continuous variables and as number (percentage) for categorical variables.
P values indicate differences between male and female coaches (Mann-Whitney U test for continuous variables; χ^2 test for dominant arm).
*Significant difference between coaches with ≥1 injury and those without injury.
†Significant difference between female coaches with ≥1 injury and those without injury.
‡Significant difference between male coaches with ≥1 injury and those without injury.
BMI, body mass index.

Training and teaching characteristics

Training and teaching characteristics are summarised in tables 2 and 3. Approximately two-thirds of coaches reported more than 8 years of professional experience, and 52% held an A-level coaching licence, the basic coaching qualification within the Dutch system (table 2). Nearly half (46%) reported additional employment alongside tennis coaching, although only 5.3% of these coaches indicated that this combination was problematic.

During summer, 28% of coaches reported teaching more than 30 hours per week compared with 20% during winter, with higher workloads reported more frequently by male coaches. Because teaching load was collected in categorical ranges rather than as exact values, the median and IQR were estimated from the cumulative frequency distribution of the categories. The estimated median teaching load was approximately 23 hours/week (IQR=13–35) during summer and approximately 18 hours/week (IQR=8–28) during winter, indicating somewhat higher weekly teaching loads during the summer season.

Clay courts were the most commonly used surface in the summer (55.7%), while artificial sand-based courts (eg, Smash Court) were most frequently used in the winter (36.0%). Similar patterns were observed for male and female coaches.

Injuries

In total, 37% of coaches reported experiencing one or more injuries in the past 2 years. Among the injuries for which the mechanism was reported (n=424), the majority were attributed to overuse (40%) or gradual factors (28%), while acute injuries accounted for 19% and other or unknown causes for 13%. Injuries most frequently affected the lower extremities (36.7%), followed by the trunk, neck and head (32.1%), and the upper extremities (29.6%). The lower back was the most commonly injured anatomical site (19.5% of all injuries), followed by the shoulder (12.0%), knee (11.6%), neck (7.4%), and elbow (6.2%) (figure 1). Here, no significant differences in

Table 2 Tennis teaching and training characteristics of coaches

Characteristic	Male (n=673)	Female (n=226)	P value	Overall (n=900)
KNLTB coaching certification, n (%)			0.99	
A-licence	331 (49.2)	135 (59.7)		466 (51.8)
B-licence	275 (40.9)	82 (36.3)		358 (39.8)
C-licence	53 (7.9)	7 (3.1)		60 (6.7)
T-licence	12 (1.8)	2 (0.9)		14 (1.6)
No licence	2 (0.3)	0 (0.0)		2 (0.2)
Teaching experience (years), n (%)			0.257	
<1	15 (2.2)	5 (2.2)		20 (2.2)
2–3	53 (7.9)	24 (10.6)		77 (8.6)
4–5	51 (7.6)	20 (8.8)		71 (7.9)
6–7	27 (4.0)	16 (7.1)		43 (4.8)
8–10	58 (8.6)	21 (9.3)		79 (8.8)
11–15	119 (17.7)	40 (17.7)		159 (17.7)
16–20	89 (13.2)	27 (11.9)		116 (12.9)
21–25	77 (11.4)	31 (13.7)		108 (12.0)
26–30	47 (7.0)	17 (7.5)		64 (7.1)
31–35	62 (9.2)	9 (4.0)		71 (7.9)
>36 years	75 (11.1)	16 (7.1)		92 (10.2)
Teaching load–summer (hours/week), n (%)			<0.001	
No teaching	20 (3.0)	11 (4.9)		31 (3.4)
<5	44 (6.5)	25 (11.1)		69 (7.7)
5–10	67 (10.0)	45 (19.9)		112 (12.4)
11–15	58 (8.6)	29 (12.8)		87 (9.7)
16–20	65 (9.7)	30 (13.3)		95 (10.6)
21–25	81 (12.0)	29 (12.8)		110 (12.2)
26–30	113 (16.8)	27 (11.9)		140 (15.6)
>30	225 (33.4)	30 (13.3)		256 (28.4)
Teaching load—winter (hours/week), n (%)			<0.001	
No teaching	39 (5.8)	23 (10.2)		62 (6.9)
<5	55 (8.2)	28 (12.4)		83 (9.2)
5–10	68 (10.1)	44 (19.5)		112 (12.4)
11–15	60 (8.9)	33 (14.6)		93 (10.3)
16–20	83 (12.3)	24 (10.6)		107 (11.9)
21–25	87 (12.9)	24 (10.6)		111 (12.3)
26–30	124 (18.4)	32 (14.2)		156 (17.3)
>30	157 (23.3)	18 (8.0)		176 (19.6)
Personal tennis participation, n (%)			0.108	
None or seldom	160 (23.8)	48 (21.2)		208 (23.1)
A few times per year	148 (22.0)	39 (17.3)		187 (20.8)
Monthly	100 (14.9)	46 (20.4)		146 (16.2)
Weekly	179 (26.6)	57 (25.2)		236 (26.2)
Several times per week	86 (12.8)	36 (15.9)		123 (13.7)
Other sports participation (hours/week)	3.5 (2.0–5.0)	3.0 (2.0–5.0)	0.434	3.0 (2.0–5.0)

Data are presented as median (25th–75th percentile) for continuous variables and as number (percentage) for categorical variables. P values indicate differences between male and female coaches (Mann-Whitney U test for continuous variables; χ^2 test for categorical variables). Sex-stratified analyses were based on the 899 coaches who reported sex; one participant preferred not to disclose sex.
KNLTB coaching licences: A-licence=entry-level instructor for recreational tennis players. B-licence=instructor for performance-oriented players. C-licence=highest certification, qualifying coaches to train elite tennis players. T-licence=temporary licence for coaches reactivating a previously obtained A, B or C certification. No licence=no valid coaching licence.
KNLTB, the Royal Dutch Lawn Tennis Association.

injury prevalence or distribution were observed between male and female coaches (table 4).

Mental health problems lasting at least 1 month during the past year were reported by 32% of coaches, based on self-reported symptoms such as anxiety, sadness, excessive worrying and persistent stress (table 5), while 6% reported having received psychological support from a professional. Five per cent of coaches smoked, while 22% had smoked in the past; the remainder reported never smoking (71%) or preferred not to answer (1%). Alcohol consumption was most commonly reported as two beverages per week (11%), followed by one beverage per week (10%) and five beverages per week (7.6%).

Impact of injuries, pain medication use and healthcare utilisation

Overall, 304 coaches (34%) reported being hindered while playing or teaching tennis due to an injury or other health problem; 26% were unable to perform at full capacity and 8% temporarily ceased teaching.

Pain medication use during tennis instruction was reported by 23% of coaches. Among coaches with health problems, healthcare utilisation was substantial: 35% consulted a physiotherapist, 35% a general practitioner, and 9% attended an emergency department, while 14% did not seek medical care.

Differences between injured and uninjured coaches

Coaches who reported one or more injuries were slightly taller (1.83 vs 1.81 m, p=0.049), had a higher body mass (81.5 vs 78.0 kg, p=0.003) and a higher body mass index

Table 3 Working conditions of tennis coaches

Characteristic	Male (n=673)	Female (n=226)	P value	Overall (n=900)
Court surfaces used for coaching—summer, n (%)				
Clay	373 (55.4)	128 (56.6)	0.507	501 (55.7)
Clay plus	50 (7.4)	20 (8.8)	0.756	70 (7.8)
Artificial grass	238 (35.4)	74 (32.7)	0.593	312 (34.7)
Artificial sand grass (eg, Smash court)	267 (39.7)	77 (34.1)	0.238	344 (38.2)
French court	25 (3.7)	8 (3.5)	0.974	33 (3.7)
Hard court (concrete)	28 (4.2)	13 (5.8)	0.596	41 (4.6)
Canada	13 (1.9)	5 (2.2)	0.957	18 (2.0)
Indoor court	21 (3.1)	7 (3.1)	<0.001	29 (3.2)
Other	27 (4.0)	6 (2.7)	0.631	33 (3.7)
Court surfaces used for coaching—winter, n (%)				
Clay	91 (13.5)	29 (12.8)	0.038	121 (13.4)
Clay plus	30 (4.5)	11 (4.9)	0.945	41 (4.6)
Artificial grass	232 (34.5)	68 (30.1)	0.375	300 (33.3)
Artificial sand grass (eg, Smash court)	251 (37.3)	73 (32.3)	0.302	324 (36.0)
French court	26 (3.9)	9 (4.0)	0.977	35 (3.9)
Hard court (concrete)*	120 (17.8)	33 (14.6)	0.483	153 (17.0)
Canada	9 (1.3)	4 (1.8)	0.888	13 (1.4)
Indoor court	204 (30.3)	56 (24.8)	0.231	260 (28.9)
Other	24 (3.6)	7 (3.1)	0.929	31 (3.4)
Career status, n (%)			0.002	
Self-employed	320 (47.5)	114 (50.4)		434 (48.2)
Employed	216 (32.1)	89 (39.4)		305 (33.9)
Owner of tennis school	137 (20.4)	23 (10.2)		161 (17.9)
Combining tennis teaching with other employment, n (%)			<0.001	
No other job	383 (56.9)	101 (44.7)		484 (53.8)
Always manageable	114 (16.9)	54 (23.9)		168 (18.7)
Often manageable	102 (15.2)	42 (18.6)		144 (16.0)
Sometimes manageable	56 (8.3)	26 (11.5)		82 (9.1)
Not manageable	18 (2.7)	3 (1.3)		22 (2.4)

Data are presented as number (percentage). P values indicate differences between male and female coaches and were calculated using χ^2 tests.
Sex-stratified analyses were based on the 899 coaches who reported sex; one participant preferred not to disclose sex.
*Significant difference between coaches with ≥1 injury and those without injury.

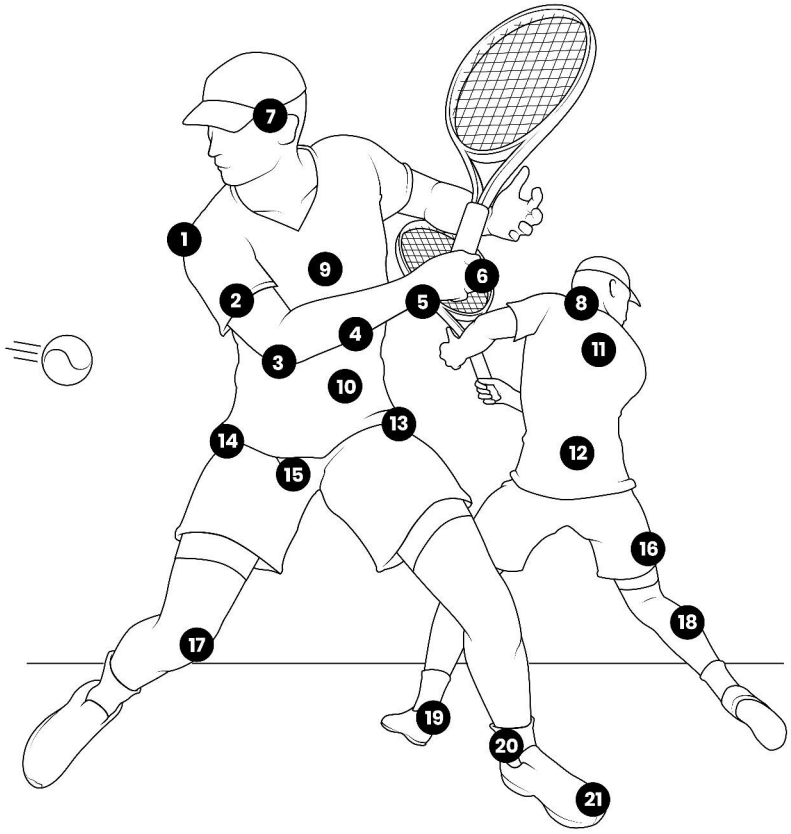
(24.5 vs 24.0 kg/m², p=0.016) than coaches without injuries.

In sex-stratified analyses, injured male coaches were older (43.0 vs 41.0 years, p=0.038) and heavier (84.0 vs 81.0 kg, p=0.023) than uninjured male coaches, whereas injured female coaches were taller (1.73 vs 1.70 m, p=0.032) and had a higher body mass (68.0 vs 65.0 kg, p=0.013) than their uninjured counterparts (table 1).

Coaches without injuries reported more frequent use of hard courts (concrete) during the winter season than injured coaches (χ^2=4.302, p=0.038). No significant differences were observed for other court surfaces (table 3).

DISCUSSION

In this national survey of tennis coaches in the Netherlands, 37% reported at least one injury in the preceding 2 years, highlighting a substantial musculoskeletal burden within this occupational group. Injuries most frequently affected the lower extremities, followed by the trunk and upper extremities, with the lower back representing the single most frequently affected anatomical site. While injury epidemiology has been extensively studied in tennis players, data on the health of tennis coaches remain limited. These findings provide insight into the potential occupational health burden associated with tennis coaching.



UPPER EXTREMITIES

1.	Shoulder	(12.0%)
2.	Upper arm	(1.4%)
3.	Elbow	(6.2%)
4.	Forearm	(3.2%)
5.	Wrist	(5.7%)
6.	Hand / Fingers	(1.1%)

Head • Neck • Trunk

7.	Head / face	(0.2%)
8.	Neck	(7.4%)
9.	Chest / Ribs / Organs	(0.6%)
10.	Abdomen	(0.3%)
11.	Upper back	(4.1%)
12.	Lower back	(19.5%)

Lower extremity

13.	Pelvis	(1.9%)
14.	Hip	(4.1%)
15.	Groin	(0.3%)
16.	Upper leg / hamstrings	(3.6%)
17.	Knee	(11.6%)
18.	Lower leg	(2.5%)
19.	Achilles tendon	(3.3%)
20.	Ankle	(4.3%)
21.	Foot / Toe	(5.1%)

Other

22.	Other	(1.6%)

Figure 1 Distribution of injury locations in tennis coaches, expressed as percentage of total reported injuries. Injuries are categorised by anatomical region (upper extremities; head, neck and trunk; lower extremity), with numbered markers corresponding to specific anatomical sites. The lower back (19.5%), shoulder (12.0%), knee (11.6%), neck (7.4%) and elbow (6.2%) are the most frequently affected anatomical sites.

Comparison with tennis players

In line with previous epidemiological studies in tennis players, lower extremity injuries were the most common injury category.[6] However, trunk injuries—particularly those involving the lower back—were relatively prominent compared with many player-based studies. This may reflect differences in age, workload characteristics and movement patterns between coaches and players. Tennis coaching involves prolonged on-court exposure, repetitive ball feeding, stroke demonstration, sustained standing and asymmetric loading patterns, which may place repeated mechanical stress on the spine and lower extremities and could be associated with gradual-onset overuse injuries. The high proportion of reported overuse injuries supports this interpretation.

Overall, the injury distribution among coaches appeared broadly similar to patterns reported in tennis players, with lower extremity injuries occurring more frequently than trunk and upper-extremity injuries.[6–10] This may reflect comparable biomechanical demands associated with tennis-related movements, despite differences in training structure and recovery opportunities between coaches and players. No significant sex differences in injury prevalence were observed.

When comparing injured and uninjured coaches, most demographic and occupational characteristics were not associated with injury status, including coaching experience, teaching hours, licence level, or most working conditions. Court surface was also not associated with injury prevalence, with the exception of winter hard courts; however, causal inference is limited by the cross-sectional design. Seasonal differences in coaching environments may nevertheless influence musculoskeletal loading. While clay courts were most commonly used during summer, indoor and other non-clay surfaces were reported more frequently during winter. Prospective studies are needed to clarify whether seasonal variation in court exposure contributes to injury risk among tennis coaches.

Anthropometric characteristics differed modestly between groups. Injured coaches were taller and heavier than non-injured coaches; however, absolute differences were small and clinical relevance is likely limited. Although greater body mass and height may theoretically increase mechanical loading of musculoskeletal tissues,[17 18] the very small differences observed in this study should be interpreted with caution. Given the cross-sectional design and reliance on bivariate comparisons, these findings do not allow causal interpretation.

Contrary to expectations, injury prevalence did not increase with age or teaching exposure. This may reflect a healthy worker/survivor effect,[19] whereby coaches with

Table 4 Anatomical location of reported injuries

Anatomical location	Male (n=673)	Female (n=226)	P value	Overall (n=900)	% of reported injury locations
Upper extremities, n (%)	142 (21.1)	45 (19.9)		187 (20.8)	29.6
Shoulders/ clavicle	53 (7.9)	23 (10.2)	0.535	76 (8.4)	12.0
Upper arm	8 (1.2)	1 (0.4)	0.618	9 (1.0)	1.4
Elbow	32 (4.8)	7 (3.1)	0.558	39 (4.3)	6.2
Forearm	17 (2.5)	3 (1.3)	0.565	20 (2.2)	3.2
Wrist	26 (3.9)	10 (4.4)	0.914	36 (4.0)	5.7
Hand/fingers	6 (0.9)	1 (0.4)	0.799	7 (0.8)	1.1
Trunk, neck, head, n (%)	154 (22.8)	49 (21.6)		203 (22.5)	32.1
Head/face	1 (0.1)	0 (0)	0.845	1 (0.1)	0.2
Neck	32 (4.8)	15 (6.6)	0.531	47 (5.2)	7.4
Chest/ribs/organs	3 (0.4)	1 (0.4)	0.998	4 (0.4)	0.6
Abdomen (incl. organs)	2 (0.3)	0 (0)	0.713	2 (0.2)	0.3
Upper back	21 (3.1)	5 (2.2)	0.768	26 (2.9)	4.1
Lower back	95 (14.1)	28 (12.4)	0.746	123 (13.7)	19.5
Lower extremities, n (%)	172 (25.5)	60 (26.5)		232 (25.8)	36.7
Pelvis	7 (1.0)	5 (2.2)	0.410	12 (1.3)	1.9
Hip	19 (2.8)	7 (3.1)	0.963	26 (2.9)	4.1
Groin	2 (0.3)	0 (0)	0.713	2 (0.2)	0.3
Upper leg (hamstring)	19 (2.8)	4 (1.8)	0.677	23 (2.6)	3.6
Knee	57 (8.5)	16 (7.1)	0.768	73 (8.1)	11.6
Lower leg	15 (2.2)	1 (0.4)	0.211	16 (1.8)	2.5
Achilles tendon	14 (2.1)	7 (3.1)	0.673	21 (2.3)	3.3
Ankle	17 (2.5)	10 (4.4)	0.345	27 (3.0)	4.3
Foot/toes	22 (3.3)	10 (4.4)	0.706	32 (3.6)	5.1
Other, n (%)					
Other location	9 (1.3)	1 (0.4)	0.537	10 (1.1)	1.6

Data are presented as number (percentage). P values indicate differences between male and female coaches and were calculated using χ^2 tests. Sex-stratified analyses were based on the 899 coaches who reported sex; one participant preferred not to disclose sex. Percentages in the male, female and overall columns represent the proportion of coaches reporting an injury at that anatomical location. The final column represents the distribution of reported injury locations across all responses.

Table 5 Mental health status

Symptom	Male (n=673)	Female (n=226)	P value	Overall (n=900)
Anxiety	21 (3.1)	12 (5.3)	0.311	33 (3.7)
Sadness	52 (7.7)	27 (11.9)	0.145	79 (8.8)
Excessive worrying	79 (11.7)	38 (16.8)	0.135	117 (13.0)
Stress/tension	80 (11.9)	41 (18.1)	0.054	121 (13.4)
Restlessness	50 (7.4)	20 (8.8)	0.756	70 (7.8)
Reduced interest or enjoyment	86 (12.8)	36 (15.9)	0.452	122 (13.6)
Other symptoms	14 (2.1)	3 (1.3)	0.765	17 (1.9)
None reported	465 (69.1)	145 (64.2)	0.307	611 (67.9)

Data are presented as number (percentage). P values indicate differences between male and female coaches and were calculated using χ^2 tests.
Sex-stratified analyses were based on the 899 coaches who reported sex; one participant preferred not to disclose sex.

more severe or persistent health problems reduce their workload or leave the profession, potentially masking associations between workload and injury in this cross-sectional sample. In addition, teaching exposure differed between seasons, with higher workloads reported during the summer months. This seasonal difference in teaching hours likely reflects increased outdoor court availability and higher tennis participation during summer. Prospective longitudinal studies are needed to clarify true exposure–injury relationships.

Health problems and impact

Approximately one-third of coaches reported mental health problems lasting at least 1 month, a prevalence comparable to that reported in other coaching populations.[20 21] Many coaches combined tennis coaching with additional employment, which may contribute to psychosocial stress and challenges in work–life balance.[22] These findings highlight the importance of considering psychological and social factors alongside physical workload in injury prevention strategies.

Despite experiencing injuries, many coaches continued teaching tennis, often while experiencing functional limitations. This underscores the limitations of time-loss–based injury definitions and highlights the importance of incorporating functional impairment when assessing health outcomes in sport.[23]

The reported use of pain medication by approximately one-fifth of coaches is concerning. While analgesics may be appropriate for short-term symptom management, frequent use carries potential health risks.[24] Coaches should be encouraged to prioritise non-pharmacological strategies such as adequate recovery, strength and conditioning, sleep and load management.[25] The substantial healthcare utilisation observed suggests that tennis coaching may represent an occupational group with relevant musculoskeletal health risks.

Clinical implications

Tennis coaches experience a considerable burden of injuries, mental health problems and healthcare utilisation. Injury prevention initiatives in tennis should therefore not be limited to players but should explicitly include coaches. National federations, employers and healthcare providers should consider implementing targeted

prevention programmes addressing workload management, recovery strategies, musculoskeletal health and mental well-being in this population.

Strengths and limitations

A key strength of this study is the large and representative sample of licensed tennis coaches and the comprehensive assessment of injuries, mental health problems, pain medication use and healthcare utilisation. However, several limitations should be acknowledged.

First, the cross-sectional design precludes causal inference. Associations between injury status and personal or occupational characteristics should therefore be interpreted cautiously.

Second, data were collected in 2021 during the COVID-19 pandemic and relied on a 2-year recall period, which may have introduced recall bias. Although restrictions affected sports participation at various times, tennis was among the first sports permitted to resume activity in the Netherlands, allowing coaching activities to continue during much of the study period, sometimes in modified formats. Because the data were collected in 2021, changes in coaching practices, workload patterns or health-seeking behaviour since that time may limit the extent to which the findings reflect the current injury profile of tennis coaches. In addition, return-to-participation timelines could also not be reliably assessed. Future research using shorter surveillance windows or prospective designs would improve measurement precision.

Third, injuries were defined based on time loss and/or healthcare consultation to ensure compatibility with existing sports injury literature and to capture clinically relevant cases. However, this definition may have underestimated subclinical or gradual-onset complaints, particularly among coaches who continue working despite symptoms. In addition, nearly half of the coaches reported additional employment alongside tennis coaching, but detailed information on the type and physical demands of these occupations was not collected. Consequently, some reported injuries may have been influenced by other occupational or non-sport activities.

Finally, the questionnaire used in this study was specifically developed for this project and had not undergone formal psychometric validation. Although it was pilot tested among tennis coaches to improve clarity and relevance, the absence of formal validation may have affected measurement precision. In addition, the majority of participants were male, reflecting the gender distribution of licensed tennis coaches in the Netherlands, which may limit the generalisability of coaching populations with different gender distributions. Analyses were based on bivariate comparisons; future studies using prospective designs and multivariable modelling are warranted to better evaluate potential risk factors for injury in tennis coaches.

CONCLUSIONS

Tennis coaches experience injury patterns comparable to those reported among tennis players, predominantly affecting the lower back and lower extremities. A substantial proportion reported ongoing injuries and mental health problems, yet many continued teaching despite functional limitations, often accompanied by considerable healthcare utilisation and pain medication use. These findings underscore the occupational health burden among tennis coaches and support the need for targeted injury prevention strategies for tennis coaches, including approaches addressing workload management, physical conditioning and recovery practices. Future research should focus on identifying modifiable risk factors and underlying mechanisms contributing to injury risk, followed by the development and evaluation of targeted preventive interventions and continued surveillance in coaching populations to improve the long-term health and sustainability of the coaching workforce.

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Ethics approval All participants provided informed consent by actively confirming their agreement via a mandatory checkbox prior to initiating the survey. The study did not fall within the scope of the Medical Research Involving Human Subjects Act (WMO); therefore, formal ethical approval was not required. This determination was confirmed by the Medical Ethics Committee Oost Netherlands (file number 2022-15266).

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