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Prevalenza ed incidenza del low back pain nello sport: Revisione sistematica della letteratura

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Andrea

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Abstract

Introduzione

Il Low back Pain (LBP) Aspecifico di natura Muscoloscheletrica è il più comune e importante problema clinico, sociale ed economico di tutti i disturbi muscolo-scheletrici. L'attività fisica e la partecipazione sportiva sono state studiate negli anni dalla letteratura scientifica e vengono promosse e consigliate per via del ruolo preventivo che giocano nello sviluppo di diverse patologie, tra cui il LBP. Tuttavia, carichi di allenamento elevati o gesti ripetuti potrebbero essere alla base dello sviluppo della patologia stessa; lo scopo di questa revisione sistematica è stato dunque indagare prevalenza e incidenza del LBP nel mondo dello sport. Sono stati sondati tutti gli sport, nella letteratura scientifica, e allo stesso modo tutte le fasce demografiche e di genere sono state indagate per avere un quadro più approfondito dello stato attuale della ricerca.

Materiali e metodi

Una ricerca sistematica della letteratura è stata condotta sui database Medline, Google Schoolar, Scopus, Web of Science. Sono stati inclusi studi cross-sectional, studi caso-controllo, studi di coorte, prospettici e retrospettivi che fossero scritti in lingua inglese, che prendessero in esame popolazione di sportivi di qualunque età, che indagassero la prevalenza e l'incidenza del LBP nei vari sport praticati. La scooping search è stata eseguita in cieco dai due revisori AC e FM, in caso di disaccordo ci si è rivolti ad un terzo revisore, FMa. Gli studi inclusi sono stati sottoposti alla valutazione del Risk of Bias (RoB) attraverso l'utilizzo degli strumenti della *"The Joanna Briggs Institute Critical Appraisal Tools"*; solo gli studi che valutati con rischio basso-moderato sono stati inclusi nella revisione.

Risultati

La ricerca delle banche dati ha individuato 2244 articoli che sono stati analizzati dai revisori. Centotrentotto studi sono risultati corrispondenti ai criteri di eleggibilità, valutati a rischio di bias basso-moderato e sono stati inclusi nella revisione. Sono stati individuati i valori di prevalenza ed incidenza nei vari sport, i fattori demografici e i possibili fattori di rischio, come il livello di gioco, gli anni di pratica e il carico di allenamento.

Discussione e conclusione

Gli sport indagati in letteratura sono numerosi, tuttavia esistono delle categorie sportive che sono state studiate in maniera più estesa e con migliore qualità metodologica; il calcio, il tennis, il nuoto e il canottaggio sono un esempio di popolazioni sportive ampiamente indagate. Negli studi analizzati l'età di 20 anni risulta spesso utilizzata per distinguere atleti adulti da quelli in fase di sviluppo, con una chiara presenza di LBP che aumenta all'aumentare dell'età. Ancora, all'interno di ogni sport, è possibile individuare una sostanziale differenza tra atleti professionisti e atleti amatoriali o chi partecipa allo sport come attività ricreazionale; questa revisione ha messo in luce come gli studi sugli atleti di Elite siano meglio condotti, ma non in numero maggiore rispetto agli amatori. Dagli studi esaminati i valori di incidenza e prevalenza sembrano essere maggiori nelle popolazioni di sportivi professionisti, in accordo con le attuali conoscenze presenti in letteratura. I dati di prevalenza e incidenza sono stati riportati in modo completo, indicando alcuni sport a prevalenza maggiore e alcuni possibili associazioni a fattori di rischio che necessitano ulteriori studi per essere approfonditi.

Introduzione

1.1 Low back pain: definizione, classificazione, epidemiologia.

"Low back pain is now the number one cause of disability globally."[1]

Il Low back Pain (LBP) rappresenta forse la patologia che maggiormente il fisioterapista si può trovare ad affrontare nella vita professionale [2] [3]. Ogni anno sono numerose le persone che sperimentano per la prima volta questo dolore, sia nella popolazione sedentaria che in quella attiva, per questo motivo la letteratura si è mossa per studiare e dare delle risposte in termini di riconoscimento della patologia e trattamento della stessa.

Il LBP viene definito come:

"Un dolore o limitazione funzionale, compreso tra il margine inferiore dell'arcata costale e le pieghe glutee inferiori, con eventuale irradiazione posteriore alla coscia, ma non oltre il ginocchio, che possa causare l'impossibilità di svolgere la normale attività quotidiana, con possibile assenza dal lavoro e sport." [2] [4]

La definizione stessa della problematica muscoloscheletrica contiene in sé la componente della limitazione della funzione e della partecipazione, mostrando perfetta consistenza con il modello dell'International Classification of Functioning, Disability and Health (ICF) introdotto a partire dal 2001 dalla World Health Organization (WHO) per fornire l'inquadramento dello stato di salute dell'individuo [5]. Il LBP ha una prevalenza negli adulti compresa tra il 50% e l'80% [6] [7] [8] ed è la seconda patologia per prevalenza nella popolazione mondiale, mentre la sua incidenza si attesta intorno al 5% [9]; ciò significa che quasi tutte le persone sperimentano almeno una volta, nell'arco della propria vita, dolore alla schiena. Il LBP è la prima causa di disabilità negli adulti con età inferiore a 45 anni, senza differenza di genere [1]. In tutto il mondo il numero di anni vissuti con disabilità a causa del LBP è aumentato del 54%, tra il 1990 e il 2015, principalmente a causa dell'invecchiamento della popolazione, con l'aumento maggiore nei paesi a medio e basso reddito [10]. La prevalenza puntuale del LBP con impatto sulle attività è del 7,3%, traducendosi in 540 milioni di persone che ne sono affette contemporaneamente. Il picco di prevalenza della patologia è tra i trenta e i cinquanta anni, questo fattore è particolarmente importante in quanto il LBP interessa una popolazione in età produttiva, con gravi conseguenze economiche e sociali [1] [10]. Il LBP risulta essere tra le principali cause di assenteismo dal lavoro, andando a generare costi diretti per esami diagnostici e terapie mediche e costi indiretti, molto maggiori, dovuti alla limitazione nello svolgimento delle normali attività della vita quotidiana e della produttività. [10] [4] Sulla base dell'eziologia è possibile identificare due sottogruppi di LBP: Specific Low Back Pain (SLBP) e Aspecific Low Back Pain o Non-specific Low Back Pain (Ns-LBP).

Quando non è possibile identificare una patologia sistemica alla base del LBP, questo viene definito aspecifico [2]. Il NSLBP ha alla base un meccanismo di dolore prevalentemente nocicettivo la cui fonte non può essere identificata, caratterizzato dalla presenza di meccanismi prevalentemente periferici, come il sovraccarico funzionale e i processi degenerativi a livello delle strutture muscolo- legamentose, dei dischi intervertebrali, delle faccette articolari e dei processi spinosi del rachide lombare, oppure dolore sostenuto prevalentemente da meccanismi centrali come sensibilizzazione centrale, alterazioni del SNC, aspetti psicosociali. Questa patologia è caratterizzata da una varietà di dimensioni bio-fisiche, psicologiche e sociali che si uniscono nel determinare l'origine del disturbo. Per lombalgia Specifica invece si intende una ridotta percentuale di casi in cui sono presenti patologie identificabili alla base del disturbo muscolo-scheletrico [11]. In questo caso è identificabile la fonte anatomica patologica che provoca il dolore del paziente. Tra queste riconosciamo: fratture vertebrali, spondilolisi e spondilolistesi, radicolopatia, sindrome da stenosi del canale vertebrale ed altre [1].

Altre cause possono essere di natura sistemica, come ad esempio infezioni, tumori, spondilo-artropatia infiammatoria, disordini del tessuto connettivo oppure il disturbo muscolo-scheletrico può presentarsi come sintomo riferito di una patologia d'organo, ad esempio in caso di aneurisma dell'aorta, pancreatite acuta, pielonefrite acuta, colica renale, ulcera peptica [11]. A causa delle sopracitate condizioni cliniche, in fase anamnestica risulta fondamentale per il clinico eseguire una approfondita raccolta anamnestica in modo da poter indagare tutti i campanelli d'allarme che in letteratura vengono chiamati Red Flag, ovvero gli indicatori della possibilità di trovarsi di fronte a patologie gravi, che hanno necessità di essere valutate da un altro professionista sanitario diverso dal fisioterapista; alcune di esse possono essere anche inquadrate come urgenze o emergenze mediche, con il bisogno di rinvio immediato in Pronto Soccorso [12] [13] [14].

Il riscontro delle Red Flag in maniera isolata non è predittivo di patologia seria, tuttavia se associate fra loro possono accrescere in maniera significativa il livello di allerta del clinico. Alcune Red Flag, anche se presenti da sole, possono indicare la necessità di eseguire un referral immediato [15]. Ne sono un esempio il Supine sign, ovvero l'incapacità del paziente a distendersi a supino o l'aumento dei sintomi in tale posizione, il Cullen's sign, indice di emorragia addominale, con ecchimosi superficiale della parete addominale e con formazione di lividi del tessuto adiposo, o la perdita di peso immotivata del 10% della massa corporea in pochi mesi [12] [14] [16]. Per questo motivo il fisioterapista dovrà attuare durante tutto il trattamento una "sorveglianza vigile" dei sintomi del paziente e correlare, qualora necessario, più sintomi minori ad una patologia non di competenza [14] [13].

Sulla base delle caratteristiche temporali è possibile classificare il LBP in:

1. Acuto

   Dall'esordio a quattro settimane.

2. Sub-acuto

   Sintomatologia persistente fino a dodici settimane.

3. Cronico

   Prolungamento dei sintomi oltre i tre mesi.

4. Recidivante o ricorrente

   Presenza di più di un evento doloroso con remissione completa negli ultimi 12 mesi.

Nella maggior parte dei casi, le persone con un nuovo episodio di LBP hanno un recupero veloce e spontaneo, l'80% circa recupera nell'arco di 6-12 settimane, tuttavia la possibilità di ricadute è comune e una piccola percentuale di persone presenta un disturbo cronico e disabilitante. Valori elevati di dolore, stress psicologico e dolore presente su aree multiple del corpo incrementa il rischio di un LBP persistente e disabilitante. Sempre più evidenze mostrano come meccanismi centrali e cognizione del dolore hanno un ruolo importante nello sviluppo di LBP persistente [1]. Sebbene la cronicizzazione si verifichi solo nel 5% dei casi, rappresenta uno dei maggiori problemi della presentazione di questa patologia. Si tratta di un disturbo complesso, di difficile gestione, in cui molti fattori, tra cui biologici, psicologici, sociali, genetici e altre comorbidità possono contribuire alla cronicizzazione; non esistono confini rigidi tra questi fattori e facilmente essi interagiscono tra loro [17] [18]. Fondamentale per il mantenimento e l'ampliamento di un substrato di dolore è anche la sensibilizzazione centrale [19]. La sensibilizzazione (CS) comprende varie disfunzioni correlate al sistema nervoso centrale, le quali contribuiscono ad un'alterata reattività, spesso aumentata a stimoli come pressione meccanica, sostanze chimiche, luce, suono, freddo, calore e stress [17]. Tali disfunzioni del sistema nervoso centrale includono un'alterata elaborazione sensoriale e inibizione del sistema di modulazione sovraspinale del dolore, il quale riceve feedback sia dalle vie ascendenti che dalla corteccia frontale e dall'ipotalamo (bottom up e top down). Il controllo top down, inoltre, costituisce la base anatomica dell'importanza della sfera cognitivo-comportamentale nella genesi e nel mantenimento del dolore muscolo-scheletrico cronico. Esistono evidenze moderate che i pazienti con CLBP presentano

modifiche strutturali e funzionali corticali e sottocorticali [20]. In questi casi vengono attivate sia aree cerebrali normalmente deputate alla sfera del dolore, sia aree che non dovrebbero esserne interessate [21].

1.2 Low back pain e Sport

Definizione di Sport:

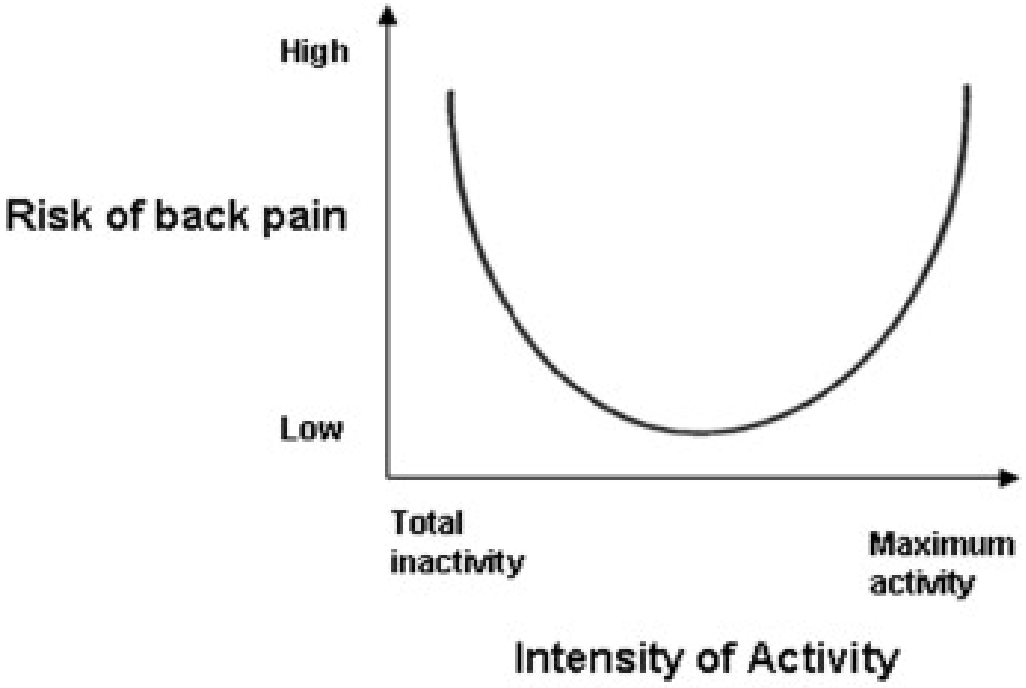
"Attività che impegna, sul piano dell'agonismo oppure dell'esercizio individuale o collettivo, le capacità fisico-psichiche, svolta con intenti ricreativi ed igienici o come professione. [22]

Qualsiasi attività fisica, reiterata nel tempo, volta all'esecuzione di una competizione, oppure più semplicemente al mantenimento dello stato di benessere dell'individuo." [22]

Il mondo scientifico riconosce in modo unanime che l'attività fisica sia necessaria per il benessere psico-fisico dell'essere umano, combattere la sedentarietà che ci è imposta da alcuni tipi di lavoro e stili di vita, al fine di prevenire malattie sistemiche e muscolo-scheletriche, sta diventando la sfida di questi decenni [23]. Nella popolazione generale è stato indagato il rapporto tra LBP e attività fisica e questo può essere rappresentato come una curva ad U [vedi figura XX], questo significa che se uno degli effetti della sedentarietà può essere il LBP, nello stesso modo un carico di attività fisica troppo alta o un aumento di ore dell'allenamento sproporzionato e poco graduale possono ugualmente essere la causa di LBP [24] [25] [26]. Nel 1999, Hoogendoorn et al. hanno studiato gli effetti legati al carico fisico durante il lavoro e il tempo libero sul LBP, trovando che alcuni lavori manuali, la flessione ripetuta e movimenti di rotazione ripetuta potevano essere fattori di rischio per la lombalgia [27] [28].

U-Shaped relation

Fig.1 Il grafico qui a fianco presenta sull'asse verticale il rischio di sviluppare low back pain, sull'asse orizzontale l'intensità di attività sportiva svolta.



Molti studi hanno dimostrato che seppur esiste questo tipo di relazione, tuttavia non è ancora stata chiarita del tutto [29]. Secondo Vuori e al (2001) c'è un vuoto di conoscenza per quanto riguarda la relazione dose-effetto ottimale di attività fisica. Riprendendo il concetto della curva U-Shaped sappiamo infatti che fare attività fisica fa bene, ma come dicevamo prima farne troppa può comportare problematiche muscolo-scheletriche tra cui il LBP [29] [30]. L'autore suggerisce che lo sportivo non professionista possa trovarsi nel range ottimale di dose-effetto dell'allenamento, mentre i professionisti sottopongono il loro corpo a continui stress meccanici, per questo motivo sarebbero più esposti al rischio di infortuni, compreso il LBP [29].

Negli atleti la prevalenza del LBP rimane in generale inferiore se paragonata alla popolazione generale e si attesta tra il 10% e il 67%, le popolazioni di atleti più colpiti sembrano essere gli sciatori, i calciatori e i rematori, anche se il dato varia a seconda dello sport che viene praticato [31]. Ad esempio, in letteratura i dati variano dal 11% della ginnastica e al 50% nei linemen del football americano, presumibilmente in relazione alle caratteristiche dello sport e del compito motorio richiesto in particolari situazioni [32]. Nello sportivo il LBP viene attribuito ad un evento traumatico specifico o a microtraumi ripetuti, fenomeni di overuse, in letteratura sono molto studiate anche le cause specifiche di LBP, molto indagate le spondilolisi e le spondilolistesi, le ernie del disco, lesioni muscolari da sovraccarico o da fatica [33]. In particolare, la fascia di età dei giovani atleti è stata studiata maggiormente per cause specifiche, proprio perché in loro è più alta la percentuale di incidenza di spondilolisi che può degenerare in spondilolistesi, particolarmente in quelli sport che comportano microtraumi ripetuti o carichi in estensione del rachide. Anche se sono già stati presentati studi e revisioni sistematiche riguardanti questo argomento, come ad esempio Tromperter K. e colleghi [32] che nel 2017 hanno studiato la prevalenza del LBP per tutti gli sport, tuttavia considerando solo la fascia di età compresa tra 14 ai 40 anni, o altresì Maselli e colleghi [12] nel 2020 che hanno presentato una revisione della letteratura sul LBP nei runner, individuando prevalenza, incidenza e fattori di rischio del LBP nella corsa, permane il nostro scopo di eseguire questa revisione per studiare la prevalenza e l'incidenza del LBP su di una vasta serie di attività sportive, in maniera più ampia possibile, includendo al suo interno il maggior numero di articoli possibili.. Tale scopo anche perché, non tutti gli sport hanno la stessa rappresentazione a livello di studi presenti in letteratura, alcuni sport sono stati molto studiati nel corso degli anni, altri decisamente meno e con scarsa qualità metodologica. Inoltre, abbiamo cercato di stratificare i dati in base al livello di partecipazione. La differenza tra atleti professionisti, dilettanti o amatoriali è un dettaglio non indifferente; questo poiché i professionisti hanno una preparazione fisica e psicologica, una metodologia negli allenamenti e nelle competizioni che gli amatoriali non hanno. Per contro le ore di allenamento sono molte maggiori esponendo il professionista ad un più alto rischio di infortunio. Dopodiché ci siamo domandati se l'età potesse essere un fattore di rischio nella prevalenza e incidenza del LBP nei vari sport presi in considerazione. Quindi sono stati divisi gli studi in base alla fascia di età della popolazione a cui facevano riferimento; adolescenti, adulti, anziani.

Tab. 1 - Definizioni dei termini principali.

Definizioni	
Prevalenza	Numero di casi di persone affette da una particolare condizione clinica all'interno di una data popolazione rilevata in un momento specifico o durante un periodo di tempo. [22]
Incidenza	-Numero di nuovi casi di una patologia in un dato periodo e in una popolazione specifica. -Rapporto di nuovi casi nella popolazione specifica. [22]
Low back pain	Dolore acuto o cronico localizzato nella regione lombare o sacrale.[9] [34]
Atleti	-Individui che hanno sviluppato abilità, resistenza fisica e forza. [35]

	-Partecipanti ad uno sport o attività fisica
Sport	-Attività che impegna, sul piano dell'agonismo oppure dell'esercizio individuale o collettivo, le capacità fisico-psichiche, svolta con intenti ricreativi ed igienici o come professione.[22] -Qualsiasi attività fisica, reiterata nel tempo, volta all'esecuzione di una competizione (match, partita, gara), oppure più semplicemente al mantenimento dello stato di benessere dell'individuo.[36]

Obiettivo dello studio

Non è chiaro quanto sia prevalente o incidente il LBP nella popolazione sportiva, quale sia lo sport con più fattori di rischio per l'insorgenza del LBP, quale fascia di età o quale tipologia di sportivo sia più a rischio fra agonisti o non agonisti. Lo scopo di questa revisione sistematica della letteratura è dunque è analizzare gli studi scientifici ad oggi pubblicati al fine di stimare la prevalenza e l'incidenza del LBP nella popolazione di atleti, proponendo una stratificazione in base alla tipologia di sport praticato, al livello di gioco, al genere e all'età e quando possibile identificare i potenziali fattori di rischio legati alle singole attività sportive.

Materiali e Metodi

2. 1 Quesito clinico

"Quali sono i valori di prevalenza ed incidenza del LBP Aspecifico nelle varie categorie di sportivi?"

Al fine di rispondere al quesito clinico è stata condotta una revisione della letteratura fino al 15 marzo 2021 utilizzando il PRISMA statement come linea guida [34]. Il PRISMA statement è stato sviluppato nel 2005 al fine di fornire indicazioni metodologiche precise e riconosciute dall'intera comunità scientifica per la redazione di revisioni sistematiche e metanalisi in ambito sanitario; comprende inoltre una checklist che è servita come scheletro e colonna portante lungo tutto il lavoro di revisione.

Il quesito di ricerca è stato posto seguendo il modello *PICO* modificato (*PECO*), in quanto obiettivo della revisione è stato indagare l'esposizione (*Exposure*) al fattore "Attività sportiva". Le banche dati consultate sono: Pubmed, Scopus, Web of science, Google Scholar. Due revisori hanno analizzato in maniera indipendente l'eleggibilità e la qualità metodologica degli studi.

Popolazione: Umani

Exposure: Attività sportiva

Comparison: Popolazione generale

Outcome: Prevalenza, Incidenza

2.2 Criteri di Eleggibilità

È stata condotta una ricerca bibliografica tra il 20 settembre 2020 e il 15 marzo 2021, tramite la ricerca elettronica delle banche dati PubMed (MEDLINE), Scopus (Embase), Web of Science (Clarivate Analytics), Google Scholar. Sono stati analizzati studi Cross-sectional, retrospettivi di coorte, retrospettivi caso-controllo, prospettici di coorte con coorte parallela e prospettici di coorte senza coorte parallela.

Sono stati *inclusi* gli studi su popolazione umana, riguardanti la prevalenza e l'incidenza del LBP non specifico negli atleti, senza restrizioni di età, in cui l'esposizione ad attività sportiva fosse ben specificata. Gli studi sono risultati eleggibili se erano riportati i valori di prevalenza o incidenza di LBP nella popolazione degli atleti e se erano scritti in inglese o in italiano, senza limiti alla data di pubblicazione per la selezione. Sono stati *esclusi* gli studi su popolazioni nelle quali il LBP era dovuto a specifiche condizioni quali, spondilolisi e spondilolistesi, radicolopatia lombare, ernia discale, frattura vertebrale; gli studi effettuati su popolazioni di donne in gravidanza o categorie specifiche come amputati e paratleti, tutti gli studi in cui l'attività sportiva non fosse specificata ma riportata in termini generici di impegno settimanale, con questionari self-reported oppure riportata come attività fisica ricreativa in cui non è stato possibile identificare il tipo di attività praticata. Non sono stati aggiunti in fase di costruzione del quesito di ricerca delle definizioni di Aspecific LBP esplicite, al fine di poter analizzare in fase di studio le definizioni attribuite nei vari studi alla problematica. Sono stati oggetto d'indagine i valori di incidenza e prevalenza del LBP negli articoli inclusi, nessun limite è stato posto riguardo il tipo di setting. Le stringhe di ricerca sono state sviluppate secondo il modello *PICO* modificato (*PECO*), tramite la ricerca di termini Medical Subject Headings (*MeSH*) come "Prevalence", "Incidence", "Low back pain", assieme a termini liberi, in combinazione con gli operatori booleani AND e OR, adattando la strategia di ricerca alle specifiche del database. Le banche dati sono state analizzate cercando di identificare il maggior numero di articoli possibile, includendo la popolazione di studio (atleti con LBP), l'outcome di interesse (incidence e prevalence) assieme a termini liberi collegati all'attività sportiva, considerata come esposizione al fattore di rischio.

Di seguito viene riportato il procedimento con cui è stata costruita la stringa di ricerca per indagare la banca dati PubMed, che comprende al suo interno Medline, un database bibliografico creato e gestito dalla National Library of Medicine (NLM), NLM, la Biblioteca Nazionale di Medicina degli Stati Uniti.

- Sono stati consultati gli elenchi ufficiali dell'International Olympic Commette (https://olympics.com/ioc) per creare un elenco con il maggior numero di termini liberi relativi alle attività sportive, inoltre è stata consultata la biblioteca della National Center for Biotechnology Information (NCBI - https://www.ncbi.nlm.nih.gov/mesh/) al fine di individuare i MeSH Therms riconosciuti dal database.

- In seguito a indagini preliminari, gli autori hanno deciso di comune accordo di non considerare il "camminare" (walking, nordic walking, etc.) come attività sportiva, in quanto la definizione risulta troppo eterogenea e non idonea secondo gli autori ad essere considerata come "Exposure".

- La stringa di ricerca è stata sviluppata unendo gli indicatori di "Population" "Exposure", "Outcome" tramite l'utilizzo dell'operatore booleano "AND".
  (Gli autori hanno riportato in maniera estensiva la strategia di creazione della stringa di ricerca per il database "Pubmed" per cui si rimanda all'Appendice.)

Il software "Mendeley" elaborato per la ELSEVIER è stato utilizzato per la gestione degli articoli e la condivisione tra gli autori della medesima biblioteca. Le variabili in studio sono state poi amministrate tramite l'utilizzo di una tabella del software "Excel" di Microsoft. Il processo di selezione è stato condotto da due revisori congiuntamente AC e FM. I revisori hanno analizzato in maniera indipendente l'eleggibilità e la qualità metodologica degli studi, in caso di dubbio o indecisione fra i due revisori si è chiesto l'intervento di un terzo revisore FMa. Sono stati estrapolati dagli articoli selezionati i valori di incidenza e prevalenza del LBP negli sport analizzati. Da ogni articolo sono stati raccolti il titolo, la tipologia di studio, l'autore e le caratteristiche di pubblicazione, la numerosità campionaria, la definizione di LBP utilizzata dell'articolo, l'attività sportiva praticata e le variabili demografiche e di genere e i potenziali fattori di rischio analizzabili per singola attività sportiva, ad esempio ore di allenamento o ruolo di gioco.

2.3 Outcomes

L'outcome principale dello studio risultano i valori di Incidenza e prevalenza del Low Back Pain negli atleti dei vari sport, sono stati inoltre presi in considerazione i dati che potessero suggerire una correlazione tra questi valori e le caratteristiche degli atleti, come ad esempio la durata degli allenamenti o l'esperienza in termini di anni di pratica dello sport, l'età anagrafica e il sesso.

2.4 Quality assessment

La valutazione del Risk of Bias (RoB) negli studi inclusi nella revisione è stata condotta in cieco dai due revisori AC ed FM, tramite l'utilizzo degli strumenti standardizzati sviluppati dal *"The Joanna Briggs Institute Critical Appraisal tools for use in JBI Systematic Reviews"[96]*. La validità interna ed esterna degli studi è stata valutata da due esaminatori AC ed FM, in caso di dubbio o disaccordo, le controversie sono state risolte tramite il parere di un terzo esaminatore FMa. Gli articoli sono stati divisi sulla base del punteggio derivato dalla valutazione del rischio di bias in basso-medio-alto rischio. Gli articoli con alto rischio di bias sono stati esclusi, mentre gli articoli con rischio basso-medio sono stati inclusi. [96]

2.5 Agreement

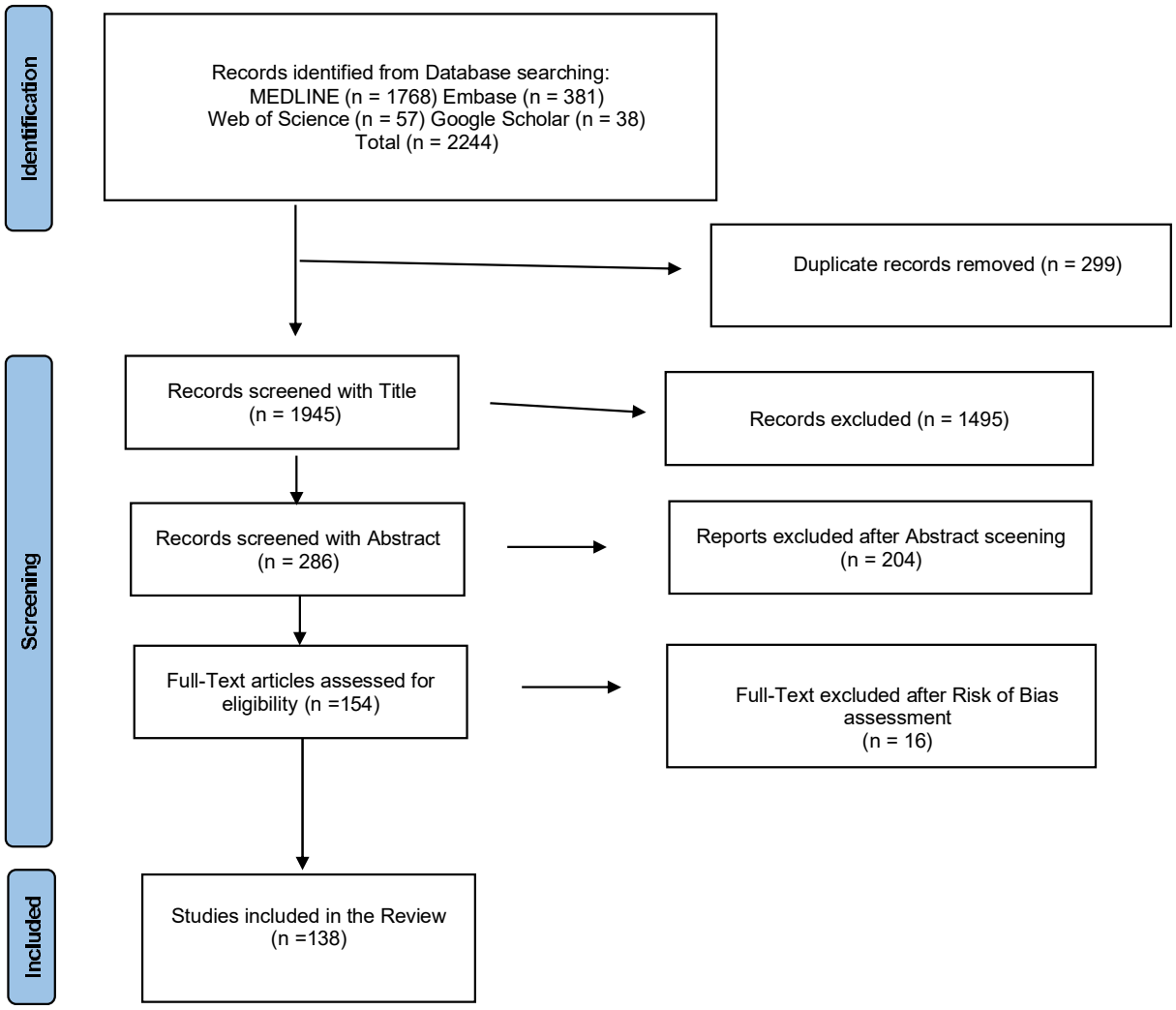
L' indice di concordanza è stato calcolato tramite il coefficiente Kappa di Cohen (K) [38] per valutare l'inter-rater agreement tra i due autori per la selezione dei full-text, risultando pari al 0.68, corrispondente ad una percentuale di concordanza del 94.01 e ad un livello elevato (buono) di accordo tra gli autori.

Il coefficiente K di Cohen è stato interpretato secondo la definizione di Altman: $k < 0.20$ basso, $0.20 < k < 0.40$ adeguato, $0.41 < k < 0.60$ moderato, $0.61 < k < 0.80$ buono, $0.81 < k < 1.00$ eccellente. [38]

Risultati

Le banche dati sono che sono state indagate, producendo un risultato complessivo di 2.244 studi, in seguito all'eliminazione dei duplicati 1.945 risultati sono stati esaminati. Gli articoli non corrispondenti con i criteri di inclusione sono stati eliminati, risultando in 490 articoli idonei per lo step successivo. Sono stati eliminati tramite lettura degli abstract gli articoli non inerenti al quesito clinico, in seguito i full-text di 286 studi sono stati sottoposti a screening.
154 studi sono stati selezionati per l'analisi qualitativa e alla valutazione del RoB, sono stati esclusi 16 articoli considerati ad elevato rischio di Bias *(Tab. 5)*, infine 138 studi sono stati incusi nella revisione poiché considerati a rischio di bias basso-medio *(Fig.2)*. Gli studi inclusi in questa revisione sono n=10 studi di coorte retrospettivi, n=24 studi di coorte prospettici, n=12 studi caso-controllo e n=92 studi cross-sectional. Tutti gli studi sono stati valutati in quanto studi di prevalenza *(Tab.2) [204],* tramite il *"The Joanna Briggs Institute Critical Appraisal tools for use in JBI Systematic Reviews"*, in seguito gli studi sono stati valutati dipendentemente dalla tipologia di studio (Cross-sectional, Case-Control, Cohort) [96], con i relativi tools *(Tab. 6-7-8)*.
Ogni domanda prevede un set di 4 risposte possibili: "YES", "NO", "NOT APPLICABLE", "UNCLEAR", sulla base dei quali viene effettuata una valutazione del RoB che risulta in 3 possibili categorie "HIGH", "MIDDLE", "LOW". Gli studi inclusi in questa revisione sono stati considerati appartenere al rischio basso-moderato (si rimanda all'Appendice per l'elenco completo degli articoli e relativa valutazione).

Fig. 2 Prisma 2009 Flow Diagram.



Tab. 2 - Checklist for Prevalence Studies. [204]

ROB question
1. Was the sample frame appropriate to address the target population?
2. Were study participants sampled in an appropriate way?
3. Was the sample size adequate?
4. Were the study subjects and the setting described in detail?
5. Was the data analysis conducted with sufficient coverage of the identified sample?
6. Were valid methods used for the identification of the condition?
7. Was the condition measured in a standard, reliable way for all participants?
8. Was there appropriate statistical analysis?
9. Was the response rate adequate, and if not, was the low response rate managed appropriately?

Tab. 2 - Elenco articoli di studio, dati demografici, partecipazione sportiva e descrizione del LBP usata nello studio.

Articoli	Study design	Population (number, age, sex)	SPORT (Type, level, training amount)	Definition of LBP
Lower Back Injuries in National Collegiate Athletic Association Football Players: A 5-Season Epidemiological Study [65]	Cohort study	Collegiate football players, 7076, age18-23, Male	american football, semi-professionalism	-
Back pain in elite sports: A cross-sectional study on 1114 athletes [66]	Cross-sectional study	Adult elite athletes + control group, 1114 + 166, age 21, male and female (not specified)	43 different sport, professionism	_
Epidemiology of injury and illness in 153 Australian international-level rowers over eight international seasons [67]	Cross-sectional study	Adult rowers, 153, male and female	Rowing, international level rowers	_
Incidence and risk factors for injury in non-elite Australian Football [68]	Cross-sectional study	Adults, 535, male	Football, non Elite footballers	_

Low back pain in young elite field hockey players, football players and speed skaters: Prevalence and risk factors [69]	Cross-sectional study	61 field hockey players (male:21; female: 40), 45 male elite football players, 75 speed skaters (male: 37; female: 38) Age between 14-25	Field Hockey, Football, Speed Skaters, professionism	LBP is defined as ache, pain or discomfort in the region of the lower back whether or not it extends from there to one or both legs (sciatica).
Significance of lumbar spondylolysis in college football players [70]	Cross-sectional study	Adults, 506 male subjects aged 18-23.	American football, semi-professionalism	_
Low back pain in female elite football and handball players compared with an active control group [71]	Cohort study	Tot 634 Females aged between 18-29 years old. 277 football players, 190 Handball players, 167 Control group.	Football, Handball professionism	_
A one-year prospective study on back pain among novice golfers [72]	Cohort study	196 male subjects age 22-60	Golf begginners	_

Back pain prevalence in adolescent athletes [73]	Cross-sectional study	2116 adolescent athlete
		1281 male
		835 female
		Age 11-17 years
			a. combat sports (boxing, judo, wrestling), n = 432;
			b. game sports (soccer, handball, volleyball), N = 600;
			c: explosive strength sport (artistic gymnastics, weightlifting, track & field, modern pentathlon), N = 417;
			d: endurance sports (canoeing, cycling,
			horse riding, rowing, swimming, triathlon), N = 495].
				_

Incidence and risk factors for back pain in young floorball and basketball players: A Prospective study [74]	Cross-sectional study	586 athletes mean age 14-16 yrs.	Basketball, Floreball Recreational level	Back pain was defined as pain in the upper and/or lower back area, that prevented the player from fully participating in the team training and playing during the following twenty-four hours.
Association between lower back pain and lower extremity pain among young volleyball players: A cross-sectional study [75]	Cross-sectional study	566 children Age between 10-12 male:145; female: 421	Volleyball	_
Sports participation and low back pain in schoolchildren [76]	Cross-sectional study	1345 Children Mean age10.7	Multisport	_
Chronic low back pain and disability in Brazilian jiu-jitsu athletes [77]	Cross-sectional study	72 Brazilian jiu-jitsu fighters Age 8 to 42 years	Brazilian Jiu-Jitsu 36 professionals 36 recreational experience range between 1 to 35 years training frequency between 2 to 6 time/weeks	_
Prevalence of back pain in a group of elite athletes exposed to repetitive overhead activity [78]	Case-control Study	181 athletes, age 13-34 y.o., m/f 166 physically active students, age 18-28 y.o., m/f	Badminton (n=23) Beach volleyball(n=10) Handball (n=56) Tennis (n=39) Volleyball (n=53) Semi-profesionism	_

Upper Extremity Pain Is Associated with Lower Back Pain among Young Basketball Players: A Cross-Sectional Study [79]	Cross-sectional study	590 elementary and middle school-aged athletes aged 6-15 y.o. male 331, female 259	Basketball, Recreational level.	_
Incidence of injury among adolescent soccer players: a comparative study of artificial and natural grass turfs [80]	Cross-sectional study	301 football players Age 13- 17 y.o.	Football, Recreational level	_
Injury profile in junior tennis players: a prospective two year study [81]	Cross-sectional study	55 subjects Age 14-17 y.o. male= 35, female=20	Tennis semi-professionalism	_
Injuries among young soccer players [82]	Cohort study	496 soccer players Age 12-18 y.o. All Male	Football (soccer) Semi-professional level	_
Lower Back Symptoms in Adolescent Soccer Players: Predictors of Functional Recovery [83]	Cohort study	12306 football players Age 8-16 y.o.	Football by recreational to professional level	_

Musculoskeletal pain and related risks in skydivers: a population-based survey [84]	Cross-sectional study	658 skydivers Age 18-29, 30-36, +36 y.o. Male 495 Female 141	sport Parachuting know as Skydiving. professional Skydivers.	_
The club-level road cyclist: injury, pain, and performance [85]	Cross-sectional study	63 subjects Age 24-65 y.o. Male 46 Female 17	Cycling recreational level	_
Coexistence of Trunk or Lower Extremity Pain with Elbow and/or Shoulder Pain among Young Overhead Athletes: A Cross-Sectional Study [86]	Cross-sectional study	2215 subjects Age 6-15 y.o. Male 1,583 Female 632	Baseball 1,422 (64.2%) Softball 14 (0.6%) Handball 28 (1.3%) Tennis 110 (5.0%) Badminton 95 (4.3%) Volleyball 546 (24.7%) recreative level	_
Mermaid health - identifying health issues related to mermaiding [87]	Cross-sectional study	8 subjects Age 41-26 y.o. All Female	Mermaiding professional level	_
Nonspecific low-back pain in Kuwaiti children and adolescents: associated factors [88]	Case-control Study	400 young subjects Age 10-18 y.o. Male 199 Female 201	Sport	_

Dancers' perceptions of pain and injury: positive and negative effects [89]	Cross-sectional study	204 subjects Age between 16 to +45 y.o. Male 29 Female 175	Dance 60% professional dancers 40% students	_
Back injuries in a Cohort of schoolchildren aged 6-12: A 2.5-year prospective study [90]	Cohort study	1240 children Age: 6-12 y.o. Female= 654 Male = 586	Horse-riding Basketball Tumbling Gymnastic Handball Swimming Soccer Other Sport Recreational level	_
Regional differences in injury incidence in European professional football [91]	Cohort study	1357 elite football players All Male	Football	_
Oral contraceptive use among female elite athletes and age-matched controls and its relation to low back pain [92]	Cohort study	829 subjects Age 14-36 y.o. All Female Football n=150 Volleyball n=205 Basketball n=361 Control group n=113	Football Volleyball Basketball Control group	Back pain was defined as the woman's subjective feeling of back pain
Low back pain in junior Australian rules football: a cross-sectional survey of elite juniors, non-elite juniors and non-football playing controls [93]	Cross-sectional study	262 young football players Age 14-18 y.o. All Male 102 from elite junior clubs 60 from non-elite junior club 100 control group	Football recreational and semi-professional levels	_

Low back pain status in elite and semi-elite Australian football codes: a cross-sectional survey of football (soccer), Australian rules, rugby league, rugby union and non-athletic controls [94]	Cross-sectional study	679 subjects Age 16-46 y.o. All Male Elite athletes= 271 Semi-elite= 360 Non athletes= 148	Rugby Professional level Semi-professional level	_
Relationship between radiographic abnormalities of lumbar spine and incidence of low back pain in high school rugby players: a prospective study [95]	Cross-sectional study	327 subjects Age 15-16 y.o. All Male	Rugby Semi-professional level	Low back pain was defined as ‘‘non-traumatic low back pain that resulted in stopping playing rugby completely for at least 1 day.’’
Lumbar intervertebral disk degeneration in elite competitive swimmers: a case control study [97]	Case-control Study	56 elite swimmers Age 15-27 y.o. 35 Male 21 Female 38 subjects as a control group (F/M)	Swimming defined as a "high load group" control group doing a recreational level of swimming	-
Spinal posture, sagittal mobility, and subjective rating of back problems in former female elite gymnasts [98]	Case-control Study	64 elite gymnasts Age: 25-43 y.o. Female	Gymnastics professional gymnasts	-
Musculoskeletal profile of the lumbar spine and hip regions in cricket fast bowlers [99]	Cross-sectional study	34 subjects: all fast bowlers Age: 18-27 y.o. 26 Female 8 Male	Cricket	_

Evaluation of elite British cyclists: the role of the squad medical [100]	Cohort study	523 cyclists Age= not reported male/female ratio = 5:1	cyclism road, track, mountain bike professional level	_
Magnetic resonance imaging findings of the lumbar spine in elite horseback riders: correlations with back pain, body mass index, trunk/leg-length coefficient, and riding discipline [101]	Case-control Study	58 elite riders 30 subjects as a control group Age 18-43 y.o. Male 18 case g./ 17 control g. Female 40 case g./ 13 control G.	disciplines: 21 show jumpers, 25 dressage riders, 12 vaulters.	__
A retrospective case-control analysis of 2002 running injuries [102]	Case-control Study	2002 patients with correlated running injuries Age: 30-39 y.o. Male926 Female1076 low back injuries= 69	Running level: not specified	_
Self-reported injury patterns among competitive curlers in the United States: a preliminary investigation into the epidemiology of curling injuries [103]	Cross-sectional study	56 self-questionnaires Age 20-64 y.o. Male 33 Female 23	Curling level: semi-professional	_
Epidemiological profile of pain and non-steroid anti-inflammatory drug use in collegiate athletes in the United States [104]	Cross-sectional study	313 collegiate athletes Age 18-20 y.o. Female 230 Male 83	Basket Baseball American football	_

Severe back pain in elite athletes: a cross-sectional study on 929 top athletes of Germany [105]	Cross-sectional study	929 athletes Age 10-58 y.o. Male= 424 Female= 505	Aviation Badminton Baseball/ Softball Basketball Beach volleyball Bobsleigh Bowling Boxing Canoe Curling Cycling Figure skating Fencing Field hockey Gymnastic Handball Horse riding Ice hockey ice skating Inline skating Judo Karate Modern pentathlon Rowing Sailing Shooting Skiing Soccer: Snowboarding Swimming Table tennis Taekwondo Track and Field Triathlon Volleyball Weightlifting Wrestling Level: professional athletes	_

The spine in sport and veteran military parachutists [106]	Cross-sectional study	221 subjects Age: mean 33 y.o. 109 athletes 112 ex-military parachutist	Parachutism Level: non professional level	_
Low Back Pain in Young Basketball and Floorball Players [107]	Cross-sectional study	401 subjects Basketball n=207 (male 101, female 106) Floreball n=194 (male 112, female 82) Age 12-21 y.o.	Basketball Floreball Level: recreational	Ache, pain, or discomfort of lumbar region with or without radiation to one or both legs (sciatica).
Low back pain in the paediatric athlete [108]	Cross-sectional study	52 children Age mean 14 y.o. Male 24 Female 23	Swimming Rugby Judo Hockey Badminton Football Tennis Skiing Diving Gymnastic/Dance Rowing Running Other sport Level: recreational	_
Epidemiology, clinical characteristics and severity of gradual onset injuries in recreational road cyclists: A cross-sectional study in 21,824 cyclists - SAFER XIII [109]	Cross-sectional study	21824 cyclists Age <30->50 y.o. Male 21311 Female 7603	cyclism road, track, mountain bike professional level	_

Back Pain in Rowers: A Cross-sectional Study on Prevalence, Pain Characteristics and Risk Factors **[110]**	Cross-sectional study	156 rowers 104 elite 52 non-elite 166 controls Age: 22 (SD 5.1)	Row, Level: international level rowers and recreational level	_
Motor control and low back pain in dancers **[111]**	Cohort study	41 dancers Age 17-26 mean 20 y.o.	Dance 60% professional dancers 40% students	_
Low back pain in competitive rhythmic gymnasts **[112]**	Case-control Study	67 rhythmic gymnastics athletes 104 age-matched control Age 13-19 y.o.	Rhythmic Gymnastics Level: semi-professionism	_
The prevalence and impact of low back pain in pre-professional and professional dancers: A prospective study **[113]**	Cohort study	168 dancers Age: 11-25 y.o. All Female	Dance Level: professional and pre-professional.	_
Physical activity and low-back pain in schoolchildren **[114]**	Cross-sectional study	546 adolescents Age 14-17 y.o. Male 53.3% Female 46.7%	Jogging Handball Swimming Gymnastic Riding Scouting Level: recreational	LBP was defined as pain or discomfort in the low-back region, from the lower rib curvature to the lower part of the seat region, as visualized by a drawing shown in the questionnaire.

Musculoskeletal injuries in young ballet dancers [115]	Cohort study	476 students a Aged 10–21 years 297 girls 179 boys	Ballet Dance level: pre-professionism	_
Low back pain among Italian rowers: A cross-sectional survey [116]	Cross-sectional study	133 Italian rowers Age 16-33 y.o., mean 19 y.o. Female 26 Male 107	Rowing Level: professionism	_
The prevalence, incidence and severity of low back pain among international-level rowers [117]	Cohort study	76 New Zealand representative rowers Male 46 female 30 Age mean 21F /22.7 M years old	Rowing Level: professionism	LBP was defined as pain, ache or discomfort in the low back with or without referral to the buttocks or legs that has been present for more than 1 week.
Life history and point prevalence of low back pain in pre-professional and professional dancers [118]	Cross-sectional study	110 subjects Age mean 17.8y.o. Male 19 Female 81	Dance Level: professional and pre-professional	_
Prevalence of low back pain in adolescent athletes - an epidemiological investigation [119]	Cohort study	272 subjects Age 12-20 y.o. Male 159 Female 113	volleyball n=35, biathlon n = 35, swimming n = 28, canoe racing n = 23, tobogganing n = 19, alpine skiing n = 18, short track n = 17, canoe slalom n = 14, ice skating n = 13, figure skating n = 10 rowing n = 10 20 other sports n<10 subjects	_

			(tot=50 athletes)	
Back and neck pain in triathletes [120]	Cross-sectional study	87 triathletes Age 20-68 y.o., mean 36.1 y.o. Male 31 Female 56	Triathlon (Swimming, Cycling, Running)	LBP was not defined
Low back pain status of female university students in relation to different sport activities [121]	Cross-sectional study	1059 subjects Age 23.1 (SD 3.8) All Female	Basketball (n = 140) Volleyball (n = 114) Futsal (n = 136) Tennis (n = 85) Badminton (n = 125) Swimming (n = 138) Track and field (n = 121) Shooting (n = 91) Karate (n = 109)	LBP was defined as ‘‘The low back pain is a pain between the last rib and lower gluteal fold as you can see in the following mannequin (grey area), which is bad enough to limit or change athletes’ daily routine or sports activities for more than 1 day and is not due to menstruation’’.

Overuse injuries in professional road cyclists [122]	Cross-sectional study	109 subjects Age: mean 26 (SD 4) All Male	Cycling Level: profesionism	Lower back pain was defined as ‘‘pain, ache, or soreness in the low-back with or without radiating pain to the gluteal area or lower extremities’’
Low back pain in childhood and adolescence: assessment of sports activities[123]	Cross-sectional study	21280 subjects Age 9-15 y.o. Male 57% Female43%	Swimming (N=5,662) Basketball (N=3,726) Soccer (N=3,534) Baseball (N=3,525) Tennis (N=2,097) Wind-instrument music (N=1,872) Table tennis (N=1,486) Volleyball (N=1,445) Athletics (N=1,324) Kendo (N=993) Karate (N=897) Badminton (N=771) Ballet (N=669) Dance (N=582) Judo (N=569) Gymnastics (N=560) Golf (N=102) Dodgeball (N=95) Rugby (N=70) Sumo wrestling, wrestling (N=48) Archery (N=23)	_
Age-related progressive increase of lower back pain among male dance sport competitors [124]	Cross-sectional study	200 subjects 44 differences country All Male Age 15-40 y.o. 3 group age-related Junior (15-18 years) senior I (19-24 years) Senior II (+25 years)	Dancing	-

Relationship between low back pain and competitive sports activities during youth [125]	Cross-sectional study	4667 subjects Age 18 (SD 0.5) Male 2620 Female 2047	Soccer tot:293 M281 F12 Baseball Tot229 M227 F2 Basketball T210 M127 F83 Track and field T185 M116 F69 Tennis T152 F100 M52 Kendo T127 F87 M40 Swimming T116 F59 M57 Volleyball T105 F39 M66	In this study was defined a low back area through a draw
Musculoskeletal pains in relation to different sport and exercise activities in youth [126]	Cohort study	6945 adolescents 15 - 16 yrs	Gymnastics, ice sports	-
Youth baseball players with elbow and shoulder pain have both low back and knee pain: a cross-sectional study [127]	Cross-sectional	1,582 athletes, males 1513 (95.6%) Females 69 (4.4%) range 6–15 years, median 11yrs	Baseball	-
The prevalence of low back pain among former elite cross-country skiers, rowers, orienteerers, and nonathletes: a 10-year Cohort study [128]	Prospective Cohort	740 Athletes, 173 rowers, 209 orienteers, 242 cross-country skiers, and 116 control subjects, mean age 33yrs	Rowing, Orienteering, Cross-country skiing	LBP, defined as ‘‘pain, ache, or discomfort in the lower back with or without radiation to one or both legs.’’
The NLstart2run study: Incidence and risk factors of running-related injuries in novice runners [129]	Prospective Cohort	1696 runners, males 364 (21.5%), Females 1332 (78.5%), mean age 43.3 yrs	Novice Running	-

Low back pain in elite cross-country skiers. A retrospective epidemiological study [130]	Cross-sectional	87 skiers, 53 (61%) men - 34 (39%) women. Mean age 21, (range 16-26)	Cross-country skiing	-
Back pain in intercollegiate rowers [131]	Cross-sectional	1632 Rowers, 936 men, 694 women, range age 20-45 yrs	Rowing	-
Lumbar intervertebral disk degeneration in athletes [132]	Cross-sectional	308 athletes, 57 males baseball players-, 47 swimmers (38 males, 9 Females), 63 basketball players (44 males, 19 Females), 51 kendo competitors (36 males, 15 Females), 47 soccer players (47 males, 0 Females),43 runners (33 males, 10 Females). Mean age 19.5 years (range, 18-23).	Baseball, Swimming, basketball, kendo, soccer, running	-
Musculoskeletal injuries in auto racing: a retrospective study of 137 drivers [133]	Cross-sectional	131 drivers, mean age 42 yrs	37 drivers were participating in formula racing, 110 in touring car/grand touring, 19 in cart, and 7 in rally.	-
Self-reported prevalence, pain intensity and risk factors of low back pain in adolescent rowers [134]	Cross-sectional	130 male rowers 235 female rowers mean age 15.1, range 14 - 16 years	Competitive Rowing	LBP was defined as pain located between L1 and gluteal folds

Prevalence and risk factors of low back pain among undergraduate students of a sports and physical education institute in Tunisia [135]	Cross-sectional	5,958 students, Mean age 21 yrs, range 18.5 -24.5 yrs	soccer, handball, basketball, volleyball, judo, weightlifting, swimming, athletics, and gymnastics	LBP was defined as pain or discomfort in the low-back region, from the lower rib curvature to the lower part of the seat region.
Low-back problems in recreational self-contained underwater breathing apparatus divers: prevalence and specific risk factors [136]	Cross-sectional	181 recreational scuba divers, 138 (76.2%) males and 43 (23.8%) Females. Mean age 39.1, 40.3 years for men and 35.0 years for women	Scuba diving recreational with a depth of less than 31 m.	-
Low back pain and other overuse injuries in a group of Japanese triathletes [137]	Cross- sectional	92 Triathletes, 70 males, 22 Females, mean age 31,3 yrs	Triathlon, average 4-1 years of training	-
Body mass, nonspecific low back pain, and anatomical changes in the lumbar spine in judo athletes [138]	Cross-sectional	82 elite male collegiate judo athletes	Judo training time 6 days per week approximatively 3 hours/day	-
Low back pain among endurance athletes with and without specific back loading--a cross-sectional survey of cross-country skiers, rowers, orienteerers, and nonathletic controls [139]	Cross- sectional	92 Triathletes, 70 males, 22 Females, mean age 31,3 yrs	Triathlon, average 4-1 years of training	-

Disc degeneration on MRI is more prevalent in young elite skiers compared to controls [140]	Cross-sectional	82 Elite male collegiate judo athletes	Judo training time 6 days per week approximatively 3 hours/day	-
Risk factors for non-specific low back pain in schoolchildren and their parents: a population-based study [141]	Cross-Sectional	skiers: Men 165 mean age 23 yrs, Women 92 mean age 21 yrs - Rowers Men 131 mean age 21 yrs Women 68 mean age 22 yrs - Orienteers Men 129 mean age 24 yrs, Women 98 mean age 23 yrs	Eliite level cross-country skiing, rowing, and orienteering	
Effect of preexisting back pain on the incidence and severity of back pain in intercollegiate rowers [142]	Cross-sectional	75 elite skiers, mean age 18.2, range 16 and 20 years of age. 47 Females, 53 males	Skiing elite level, alpine (n = 59) and mogul skiers (n = 16). average 9–11 training hours/ week	The definition of back pain was limited to pain that lasted at least 1 week.
Is active participation in specific sport activities linked with back pain? [143]	Cross sectional	439 Children aged 12–13, Females 53% - males 47%	Gymnastics, rhythmic gymnastics, soccer, ball games swimming, badminton/tennis, horseback riding, running, cycling, roller skating/skateboarding, martial arts - 1–5 hours / week	Back problems were defined as the 1-month prevalence (pain reported on the day of the study, in the week, or in the month preceding the interview) specifically for any area of the spine (low back, mid back or neck).
Injury patterns in elite preprofessional ballet dancers and the utility of screening programs to identify risk characteristics [144]	Retrospective Cohort	The dancers ranged in age from 9 to 20 years mean age 14.7 years, 80% (288) Females and 20% (71) males	Professional Ballet, approximately 20 hours of ballet per week,	-

The experience of back pain in young Australians [145]	Case-control	183 dancers or gymnasts Females 126 mean age 16,9, 57 males mean age 17,3	Gymnastic, Dancing training time 6 hours /week minimum	Back pain was explained and identified as "back pain or pain you think comes from your back"
Joint pain and osteoarthritis in former recreational and elite cricketers [146]	Cross-sectional	846 cricketers, aged median 62, range 54 -69. male 97%, female 3%	Cricket, experience of play median 33(21–41) yrs - 38% (n = 318) had played cricket at an elite level, 62% (n = 511) had only played recreationally	-
Injuries among world-class professional beach volleyball players. The Fédération Internationale de Volleyball beach volleyball injury study [147]	Cross-sectional	566 volleyball players, median age 11, range 6-15 years, Male 145 - Female 421	Volleyball	Body parts, including the head, lower back, and each joint, were illustrated by a drawing and multiple-choice answers were allowed. Participants who checked lower back, knee, or ankle were determined to have LBP, knee pain, or ankle pain, respectively.
Low back pain and physical exercise in leisure time in 38-year-old men and women: a 25-year prospective Cohort study of 640 school children [148]	Prospective Cohort	481 subjects (222 M and 259 F)	Gymnastics, Ball game, Tennis/badminton Swimming Running, Bicycling mean 3 h/week	-
Incidence and risk factors of running-related injuries during preparation for a 4-mile recreational running event [149]	Cross-sectional	629 runners, 207 men (33%) and 422 women (67%). Mean age 43.7 yrs	4-mile running Two training time 2.4 hours/week	musculoskeletal pain of the back causing a restriction in running for at least 1 day.

Influence of saddle type upon the incidence of lower back pain in equestrian riders [150]	Cross-sectional	108 riders, 34 male, 74 females	Equestrian riding	-
Low Back Pain in School-Aged Martial Arts Athletes in Japan: A Comparison among Judo, Kendo, and Karate [151]	Cross-sectional	896 school-aged martial arts athletes, 607 male -289 female, range age: 6-15 years,	Judo, Kendo, and Karate.	-
Back Pain Prevalence and Its Associated Factors in Brazilian Athletes from Public High Schools: A Cross-Sectional Study [152]	Cross-sectional	251 athletes, 173 males and 78 Females, mean age 16.4 years old, range 14 -20 y.o.	Volleyball, Basketball, Handball, or Soccer.	-
Evaluation of factors associated with severe and frequent back pain in high school athletes [153]	Cross-sectional	251 athletes (173 [68.9%] boys and 78 [31.1%] girls), range 14–20 years old,	Handball Soccer Basketball Volleyball	-
Musculoskeletal predictors of non-contact injury in cricketers - Few and far between? A longitudinal Cohort study [154]	Prospective Cohort	97 male professional, domestic-level (playing for franchise teams) cricketers	Cricket	-

Injuries in students of three different dance techniques [155]	Prospective Cohort	444 students average age 23.10 for modern dance, average age 23.85 yrs for Mexican folkloric, average age 22.5 yrs for Spanish dance	Modern dance, Mexican folkloric, Spanish dance, training times range 11.6 to 13.3 hrs/wk	-
Low back pain in a Cohort of 622 Tunisian schoolchildren and adolescents: an epidemiological study [156]	Cross-sectional	326 Females and 296 Males, mean age 14.1 years, range, 11–19 years	Football Basketball Handball Swimming Volleyball Bowling Gymnastics	-
Symptoms of musculoskeletal disorders in stage rally drivers and co-drivers [157]	Cross-sectional	118 participants, 41 drivers, 45 co-drivers, 110 men, 8 women, mean age 34 y.o.	Rally Race	-
Musculoskeletal screening as a predictor of seasonal injury in elite Olympic class sailors [158]	Prospective Cohort	n=22 athletes, mean age 22 y.o., 15 male mean age 22,4 and 7 female mean age 21,5	Sailing (regatta)	-
Assessment of musculoskeletal pain in dance focusing on dance-style related differences [159]	Cross-sectional	145 female non-professional dancers n = 64 (44.1%) mainly performing ballet, mean age 29.5 y.o. and n = 81 (55.9%) performing jazz/modern/contemporary dance mean age 25.0 y.o.	Dance styles: ballet or modern/jazz dance/contemporary dance mean of 16 years of experience	-

Lower limb and back injury patterns of elite netball players [160]	Cross-sectional	228 Players, 75 players from the Open, mean age 23.7 78 players from the U/21, mean age 19,2 75 players from the U/16, mean age 14,8	Netball competition level	
High Prevalence of Disc Degeneration and Spondylolysis in the Lumbar Spine of Professional Beach Volleyball Players [161]	Cross-sectional	29 players, mean age 28 years (range, 19-39years).	Volleyball	-
Lifetime musculoskeletal symptoms and injuries among former elite male athletes [162]	Cross-sectional	n=29 Weightlifters, n=31 Soccer players, n=28 Runners, n=29 Shooters	Weightlifting, Soccer, Long distance running, shooting	-
No Pain, No Gain? Prevalence, Location, Context, and Coping Strategies with Regard to Pain Among Young German Elite Basketball Players [163]	Cross-sectional	182 junior competitive athletes, mean age 15.5 (min:13; max: 19) years, 70.9% male	Basketball	-
High prevalence of low back pain among young basketball players with lower extremity pain: a cross-sectional study [164]	Cross sectional	592 young basketball, median age 13 y.o., range 12-14 y.o. Male 332 (56.1%) Female 260 (43.9%)	Basketball	-

A history of low back injury is a risk factor for recurrent back injuries in varsity athletes [165]	Prospective Cohort	679 Yale University including 422 men and 257 women with an average age of 19 years	varsity athletes representing 30 sports	injury was defined as any low back pain that caused an athlete to miss or not participate fully in at least three practice sessions or competitions and that resulted in a visit to a sports physician
Nonspecific Low Back Pain among Kyokushin Karate Practitioners [166]	Cross-sectional	100 athletes, 74 men, 26 women	Kyokushin karate	
Incidence of back pain in adolescent athletes: a prospective study [167]	Prospective Cohort	321 (183 males/138 Females) participants mean age of 13.1 y.o.	Bob (n = 1), Boxing (n = 11), Soccer (n = 41), Artistic Gymnastics (n = 4), Weight lifting (n = 9), Handball (n = 28), Judo (n = 15), Canoeing (n = 17), Karate (n = 1), Athletics track & field (n = 32), Modern pentathlon (n = 7), Cycling (n = 16), Horse riding (n = 45), Wrestling (n = 35), Rowing (n = 24), Swimming (n = 17), Shooting (n = 5), Triathlon (n = 2), Volleyball (n = 11)	Back pain was defined as acute pain present at the time of answering the questionnaire and/or during the 7 days prior to the examination
Low Back Pain Among Weightlifting Adolescents and Young Adults [168]	Cross-sectional	93 players, 87 males, 6 Females Mean age 21 y.o. Range 16 -26 y.o.	Weightlifting	-

The prevalence of musculoskeletal pain and use of painkillers among adolescent male ice hockey players in Finland [169]	Retrospective Cohort	Study =121 males, Control = 618 Males Mean age = 15 years, Rage = 14–16 years	Ice Hockey national-level IHP	-
Lumbar Multifidus Muscle Characteristics, Body Composition, and Injury in University Rugby Players [170]	Cross-sectional	37 players, mean age 21,4 years Female 21, mean age 21,4 Males 16, mean age 20.9	Rugby mean 5,1 years of experience 51 % competitive level	-
Overuse Injuries in Professional Ballet: Injury-Based Differences Among Ballet Disciplines [171]	Cross-sectional	145 Dancers 75 female, mean age 26,27 70 male, mean age 25,24	Neoclassical, Spanish dance, Contemporary, Classical Years of practice Male 14.24 Female 18.34 ± 5.50	-
Low back pain among Italian runners: A cross-sectional survey [172]	Cross-sectional	2539 mean age 40,42 Range 18-77 years old Male 69,24 Female 30,76	Running	-
Prevalence and Consequences of Injuries in Powerlifting: A Cross-sectional Study [173]	Cross-sectional	104 53 female mean age 26.7 51 male mean age 30.1	Powerlifting Mean 3.6 years of practice	-

Analysis of Postural Risk and Pain Assessment in Bharatanatyam Dancers [174]	Cross-sectional	50 Females mean age 21.4	Bharatanatyamn (Ancient Indian classical dance) 62.5% students - 37.5% professional	-
Mechanical lower back pain and sacroiliac joint dysfunction in golfers at two golf clubs in Durban, South Africa [175]	Cross-sectional	271 players Males 235 (86.7%) - Females 36 (13.3%) Range 21 - 55 years old	Golf	Mechanical lower back pain (MLBP)
Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players [176]	Cross-sectional	131 senior players (107 men/24 women) with a mean 56.8 range 50 to 66 years	Paddle-tennis average playtime 9.4 years Beginners 6.1% Intermediate 79.4% Advanced 14.5%	-
A preliminary study to investigate the prevalence of pain in elite dressage riders during competition in the United Kingdom [177]	Cross-sectional	50 riders ranged 19-52 years	Elite Dressage	-
Lower extremity and spine pain in cyclists [178]	Cross-sectional	167 people, mean age 30.98 range 15 - 56 years old	amateur cyclists	-

Elite level rhythmic gymnasts have significantly more and stronger pain than peers of similar age: a prospective study [179]	Prospective Cohort	243 females Study=144 female, mean age 15.24 Control =99 female, mean age 16.05	Elite level rhythmic gymnastic FIG 29th European Championships in RG in Vienna.	-
Non-specific low back pain in male professional football players in the Turkish super league [180]	Cross-sectional	121 males, mean age of 23.8 ranged from 16 to 34 years	Professional football	-
Musculoskeletal disorders (MSDs) in dancers and former dancers participating in the largest dance festival in the world [181]	Cross-sectional	173 participants (111 female, 25 former, 28 Male, 9 former) mean age 28.7 years old	the 27th Festival de Joinville in Santa Catarina, Brazil Classical, Jazz	-
Determining the prevalence and causes of sport injuries among female volletball players of iran super league [182]	Cross-sectional	118 female, average age of 22.5 years.	volleyball championship tournaments of universities	-
Multifidus muscle size and symmetry among elite weightlifters [183]	Cross-sectional	31 elite weightlifters (15 males and 16 Females) Mean age 21.4	Weightlifting	LBP was defined as pain localized between T12 and the gluteal fold

Prevalence of injuries in triathletes from a French league [184]	Cross-sectional	309 Triathletes, female 17.9%	triathlon average volume of training 8.9 hours/week for the three disciplines (an average of 4.6 km swim, 120.2 km bike and 26.8 km run)	-
Epidemiology of musculoskeletal injuries among elite biathletes: A preliminary study [185]	Cross-sectional	116 biathletes 44% male and 56% female 21- 30 years old	Biathlon, Winter Olympic sport that combines cross- country skiing with shooting. competition of the World Cup 2008/2009,	-
Prevalence of low back pain in former rhythmic gymnasts [186]	Case-control	Study = 60 Females Mean age 38 Control = 60 Females Mean age 39	Rhythmic Gymnastic retired athletes - healthy controls	-
Low back pain in competitive rhythmic gymnasts [187]	Case-control	Study n=67 Females 14,7 mean age Control n=104 14,7 mean age age 13-19	Rhythmic Gymnastics competitive level	-
Comparing injuries of spin bowling with fast bowling in young cricketers [188]	Prospective Cohort	113 bowlers Age (years) 14.9	Cricket fast bowlers spin bowlers averaged 22 balls in 5-minute	-

Musculoskeletal pain in elite competitive male swimmers [189]	Cross-sectional	38 males mean age 14.78	Elite swimming breaststrokers, butterflyers, methods free-stylers and backstrokes mean years of training 5.83	-
Injuries in Young Female Elite Gymnasts [190]	Cross-sectional	Female n=29 12.4 mean age	Gymnastics 6.1 years of training	-
Epidemiology and pain in elementary school-aged players a survey of Japanese badminton players participating in the national tournament [191]	Prospective Cohort	Age 7-12 years 611 players (260 males, 351 Females)	Badminton	-
Is average club head speed a risk factor for lower back injuries in professional golfers? A retrospective case control study [192]	Case-control	Study n= 36 Control n=28 mean age = 36.2 (same)	Golf	-
Prevalence of sports injuries and chronic pain in athletes practicing kickboxing and taekwondo [193]	Cross-sectional	99 sportsmen Kickboxing n = 52, age 24.27 ±4.77 Taekwondo n=47 age 23.09 ±4.96 aged 16-35	Kickboxing = years of experience 4.61 ±3.88 Taekwondo = years of experience 6.22 ±3.39	-

Association between adolescent sport activities and lumbar disk degeneration among young adults [194]	Cross-sectional	6795 16 -19 y old	Running Cycling, Swimming Football, Ice-hockey Floorball Skating, Dancing	-
Epidemiology of Overuse Injuries in Youth Team Sports: A 3-year Prospective Study [195]	Prospective Cohort	from 387 (176 female and 211 male) 15.7±1.7 years	Basketball Floorball	-
Back pain and MRI changes in the thoraco-lumbar spine of young elite Mogul skiers [196]	Case-control	Study n =16 Mean age 17.6 years Male gender, n =14 (87%), Female gender, n =2 (13%) control n =28 mean age 16.4 years Male gender n =9 (32%), female gender n= 19 (68%) age 15–20 years	Skiing	-
Mechanical low back pain in elite track and field athletes, an observational Cohort study [197]	Prospective Cohort	130 83 males and 47	sprinters (100 m, 200 m, 400 m, 110 m hurdles, 100 m hurdles, 400 m hurdles), throwers (hammer throw, javelin, discus, shot- put) and jumpers (pole vault, long jump, triple jump, high jump).	The diagnosis of mechanical lumbar pain was classified as: 1) disc pathology (degenerative disc disease, disc herniation), 2) muscle and ligament sprain and 3) pathologies of the posterior elements of the spine (facet joint syndrome, spondylolysis/spondylolisthesis).
Analysis of running related injuries, the Vienna study [198]	Prospective Cohort	Number178, Female (55.6%) Males (44.3%) Age (years) 33.3 ± 11 Range 18–69 y old Female (mean) 32.5 Male (mean) 34.4	running Running history (years) 6.9 ± 7.7 Female 5.3 ± 4.5 Male 9 ± 10.1	-

Injuries to elite rowers over a 10-yr period [199]	Prospective Cohort	84 female and 88 male	Elite rowers	-
Cross sectional associations between the diversity of sport activities and the type of low back pain in adulthood - Kaartinen – 2019 [200]	Retrospective Cohort	(n=3737,57% Females)	running cycling, cross-country skiing ice skating roller skating skiing snowboarding yoga Pilates Golf	-
Neck pain and low back pain in relation to functional disability in different sport activities [201]	Cross-sectional	377 males Age 12-20 y. o.	Football, Volleyball Wrestling Basketball	-
Sport-specific Risk and Protective Factors for Low Back Pain in Olympic Class sailors and epidemiologic analytic Cohort study - Hunt 2016 [202]	Prospective Cohort	152 subjects aged 18-65 y.o.	Olympic class regatta	-
The relationship between low back pain and sport practice in young people -Vidal-Conti [203]	Cross-sectional	5thand 6th grade primary school students 2,270 participants (sampling error of 2%) 1,214 boys (53.5%) 1,056 girls (46.5%) mean age 11.1 10 years old (24.1%), 11 years old	Sports among boys: football (n=576, 47.4%), basketball (n=158, 13%), tennis (n=123, 10.1%), martial arts (n=109, 9%), swimming (n=136, 12.9%), cycling (n=61, 5.8%), futsal (n=62, 5.1%), handball	Low back pain is defined as pain and discomfort, localised below the costal margin and above the inferior gluteal folds, with or without leg pain. Nonspecific (common) low back pain is defined as low back pain not attributed to recognisable, known

	(43.3%), 12 years old (32.6%)	(n=45, 3.7%), gymnastics (n=27, 2.2%), volleyball (n=17, 1.4%), athletics (n=15, 1.2%) and other sports (n=36, 3%). On the other hand, the most frequently practised sports among girls were: rhythmic gymnastics (n=161, 15.2%), basketball (n=127, 12%), tennis (n=87, 8.2%), swimming (n=88, 7.2%), cycling (n=84, 6.9%), football (n=56, 6.2%), volleyball (n=59, 5.6%), martial arts (n=54, 5.1%), handball (n=36, 3.4%), athletics (n=29, 2.7%), futsal (n=11, 1.1%) and other (n=76,	specific pathology

Tab. 3 - Articoli di studio con relativi valori di incidenza e prevalenza del LBP.

Articoli	Incidence	Prevalence
Lower Back Injuries in National Collegiate Athletic Association Football Players: A 5-Season Epidemiological Study [65]	Injury rate 1.80 for 10.000 hours of exposure	Mean prevalence 64.3% -66.7%
Back pain in elite sports: A cross-sectional study on 1114 athletes [66]		All Athletes: Lifetime prevalence 88.5%, 12 Month Prevalence 81.1% Archery: LT 87.5%, 12 MONTH 87.5% Badminton: LT 80.0%, 12 MONTH 80.0% Basketball: LT 90.5%, 12 MONTH 90.5% Beach volleyball: LT 90%, 12 month 80% Bobsleigh: LT 100%, 12 MONTH 100% Boxing: LT 71.4%, 12 MONTH 57.1% Canoe LT 93.9%, 12 MONTH 84.8% Curling: LT 91.7%, 12MONTH 91.7% Cycling: LT 86.8%, 12 MONTH 82.2% Dancing: LT 95.5%, 12MONTH 90.9% Diving: LT 100%, 12 MONTH 80% Fencing: LT 100%, 12 MONTH 95.7% Figure skating: LT 93%, 12 MONTH 80% Gymnastic: LT 93.8%, 12 MONTH 87.5% Handball: LT 83.9%, 12 MONTH 83.9% Hockey: LT 86.2%, 12 MONTH 82.8% horse riding: LT 87.5%, 12 MONTH 87.5% Ice hockey LT 88.9%, 12 MONTH 85.2% Judo: LT 91.2%, 12MONTH 79.4% Karate: LT 78.6%, 12 MONTH 71.4%
		Luge: LT 100%, 12 MONTH 100% Rowing: LT 96.4%, 12 MONTH 95.2% Rugby: LT 83.3%, 12 MONTH 73.3% Sailing: LT 83.3%, 12 MONTHS 83.3% Shooting: LT 95.7%, 12 MONTH 87%

		Skiing: LT 87.8%, 12 MONTH 73.5% Soccer: LT 100%, 12 MONTH 100% Speed skating: LT 93.9%, 12 MONTH 84.4% Swimming: LT 88.9%, 12 MONTHS 73.3% Synchronised swimming: LT 66.7%, 12 MONTHS 66.7% Table tennis: LT 0.0%, 12 MONTHS 0.0% Taekwondo: LT 90.0%, 12 MONTHS 90.0% Tennis: LT 85.7%, 12 MONTHS 78.6% Track and Field: LT 86.9%, 12 MONTHS 83.8% Triathlon: LT 56.3%, 12 MONTH 43.8% Underwater rugby: LT 89.7%, 12 MONTH 89.7% Volleyball: LT 91.7%, 12 MONTHS 69.4% Water polo: LT 100%, 12 MONTH 89.5% Weightlifting: LT 82.9%, 12 MONTHS 71.4% Wrestling: LT 77.8%, 12 MONTH 66.7%
Epidemiology of injury and illness in 153 Australian international-level rowers over eight international seasons [67]	0.4 female, 0.5 male per year	Mean prevalence 21.1%
Incidence and risk factors for injury in non-elite Australian Football [68]	Mean incidence 5%	_
Low back pain in young elite field hockey players, football players and speed skaters: Prevalence and risk factors [69]	_	Field Hockey Males 33% Field Hockey Females 67% Football Males 64% Speed Skating Males 54% Speed Skating Females 66% (12 mesi)
Significance of lumbar spondylolysis in college football players [70]	_	Mean prevalence 26.6%
Low back pain in female elite football and handball players compared with an active control group [71]	_	Lifetime prevalence:Football players 60% Handball 62.6% control group 65.3% 12 monthsFootball 56.9% Handball 59.3% Control group 59.8%

A one-year prospective study on back pain among novice golfers [72]	Involved in other sport 5% not involved in other sport 13%	Lifetime 63% last month 28%
Back pain prevalence in adolescent athletes [73]	_	Mean prevalence 9%
Incidence and risk factors for back pain in young floorball and basketball players: A Prospective study [74]	Mean incidence 8.7%	Point prevalence13% Lifetime prevalence 53%
Association between lower back pain and lower extremity pain among young volleyball players: A cross-sectional study [75]	_	Point prevalence 9.5%
Sports participation and low back pain in schoolchildren [76]	_	Lifetime: boy 59.2% girl 76.1%
Chronic low back pain and disability in Brazilian jiu-jitsu athletes [77]	_	Total group 80.6% Professional Jiu-Jitsu athlete 88.9% Recreational athletes 35.6%
Prevalence of back pain in a group of elite athletes exposed to repetitive overhead activity [78]	_	Lifetime athletes: 85% 12-month prevalence: 75%, 3-month prevalence: 58%, Point prevalence: 38%.
Upper Extremity Pain Is Associated with Lower Back Pain among Young Basketball Players: A Cross-Sectional Study [79]		point prevalence 12.9%
Incidence of injury among adolescent soccer players: a comparative study of artificial and natural grass turfs [80]	_	Prevalence of LBP training on Natural Turf 33.3%prevalence of LBP in athletes training on Artificial Turf 42.3%
Injury profile in junior tennis players: a prospective two-year study [81]	0.6/1000 h playing tennis	point prevalence 20%

Injuries among young soccer players [82]	_	Age 12-13, N=137. Point prevalence=13.1% Age 14-15, N=67. Point prevalence= 19.4% Age 16-17, N= 108. Point prevalence= 11.1%
Lower Back Symptoms in Adolescent Soccer Players: Predictors of Functional Recovery [83]	Mean incidence 3%	Mean prevalence 49%
Musculoskeletal pain and related risks in skydivers: a population-based survey [84]	_	Mean prevalence 45%
The club-level road cyclist: injury, pain, and performance [85]	_	Mean prevalence 30.2%
Coexistence of Trunk or Lower Extremity Pain with Elbow and/or Shoulder Pain among Young Overhead Athletes: A Cross-Sectional Study [84]		Prevalence in sport: Baseball= 4.3% Softball= 7.1% Handball= 17.9% Tennis= 11.8% Badminton= 6.3% Volleyball= 10.1%
Mermaid health - identifying health issues related to mermaiding [87]	_	50%
Nonspecific low-back pain in Kuwaiti children and adolescents: associated factors [88]	_	Male 25.7% Female 3.1%
Dancers' perceptions of pain and injury: positive and negative effects [89]	Mean incidence 8.3%	Point prevalence 29.9% Lifetime 32.4%
Back injuries in a Cohort of schoolchildren aged 6-12: A 2.5-year prospective study [90]	Incidence rate per 1000 physical activity units:Horse-riding 2.45 Basketball 1.58Tumbling Gymnastic 1.25Handball 0.31Swimming 0.30Soccer 0.20Other Sport 0.20	_
Regional differences in injury incidence in European professional football [91]	Injury incidence is expressed as the number of injuries per 1000 exposure hours with 95% confidence interval (95% CI). northern group 0.20 southern group 0.10	_

Oral contraceptive use among female elite athletes and age-matched controls and its relation to low back pain [92]	_	Present LBP O.C. users Football 30% Volleyball 39% Basketball 23%Control group 19%Present LBP non O.C. users.Football 34%Volleyball 28%Basketball 19%Control group 17%Previous LBP O.C. usersFootball 41%Volleyball 64%Basketball 51%Control group 45%Previous LBP non O.C. usersFootball 43%Volleyball 59%Basketball 54%Control group 42%
Low back pain in junior Australian rules football: a cross-sectional survey of elite juniors, non-elite juniors and non-football playing controls [93]	In Elite junior (n = 102) LBP average mean (SE) 21.68 (1.92) In Non-elite junior (n=60) LBP average mean (SE) 11.90 (1.60)	_
Low back pain status in elite and semi-elite Australian football codes: a cross-sectional survey of football (soccer), Australian rules, rugby league, rugby union and non-athletic controls [94]	_	LBP average (similar to long life prevalence): Elite athletes= 24.9 Semi-elite= 19.4 Non athletes= 11.2
Relationship between radiographic abnormalities of lumbar spine and incidence of low back pain in high school rugby players: a prospective study [95]	Mean Incidence 44%	
Lumbar intervertebral disk degeneration in elite competitive swimmers: a case control study [97]	_	Lifetime High load group 77% control group 87%
Spinal posture, sagittal mobility, and subjective rating of back problems in former female elite gymnasts [98]		Lifetime: 47%
Musculoskeletal profile of the lumbar spine and hip regions in cricket fast bowlers [99]		Lifetime= 54%
Evaluation of elite British cyclists: the role of the squad medical [100]	Incidence in six years pure Track riders= 34% pure Road ricers= 28%	_

Magnetic resonance imaging findings of the lumbar spine in elite horseback riders: correlations with back pain, body mass index, trunk/leg-length coefficient, and riding discipline [101]	_	Show jumpers= 86% Dressage riders= 92% Vaulters= 83% Control group= 33%
A retrospective case-control analysis of 2002 running injuries [102]	Mean Incidence 3.4%	_
Self-reported injury patterns among competitive curlers in the United States: a preliminary investigation into the epidemiology of curling injuries [103]		Lifetime 33%
Epidemiological profile of pain and non-steroid anti-inflammatory drug use in collegiate athletes in the United States [104]	_	Male 28% Female 35%
Severe back pain in elite athletes: a cross-sectional study on 929 top athletes of Germany [105]		General 12-month prevalence: 55% 12-month prevalence in %:Aviation= 81.8%Badminton= 57.1Baseball/ softball= 60 Basketball= 54.5 Bobsleigh= 76.9 Bowling= 83.3 Boxing= 28.6 Canoe = 72.0 Curling= 57.1Cycling = 74.1 Figure skating=66.7Fencing=62.5 Field hockey= 70Gymnastic= 73.3Handball= 28horse riding= 100Ice hockey= 67.9 Ice skating= 65.0 Inline skating= 69.4 Judo= 58.1Karate= 50.0 Modern pentathlon= 77.8
	_	Rowing= 78.6 Sailing= 66.7 Shooting= 82.4 Skiing= 50.8 Soccer= 75.0 Snowboarding= 50.0 Swimming= 56.1table tennis= 62.5 Taekwondo= 80 Track and Field= 58.8Triathlon= 50 Volleyball= 79.2 Weightlifting= 58.8 Wrestling= 61.1
The spine in sport and veteran military parachutists [106]	_	Lifetime prevalence 44.5%
Low Back Pain in Young Basketball and Floorball Players [107]	_	Lifetime prevalence Basketball 45% Floreball 64%

		12 Month prevalence Basketball 44.4% Floreball 61.9%
Low back pain in the paediatric athlete [108]	_	Point Prevalence 83%
Epidemiology, clinical characteristics, and severity of gradual onset injuries in recreational road cyclists: A cross-sectional study in 21,824 cyclists - SAFER XIII [109]	Retrospective annual incidence of GOIs was 2.5%	The point prevalence (at the time of race registration) of GOIs: 1.1% Lifetime prevalence of GOIs: 2.8%
Back Pain in Rowers: A Cross-sectional Study on Prevalence, Pain Characteristics and Risk Factors [110]	_	Lifetime P.:Elite 94%Non-Elite 94% 12 Month P.:Elite: 91%Non-Elite 85%
Motor control and low back pain in dancers [111]	_	Lifetime prevalence 41%
Low back pain in competitive rhythmic gymnasts [112]	_	Point Prevalence 10.4%
The prevalence and impact of low back pain in pre-professional and professional dancers: A prospective study [113]	_	78%
Physical activity and low-back pain in schoolchildren [114]	_	3 months Prevalence Jogging 58.6% Handball 67.2% Swimming 40.5% Gymnastics 60.0% Riding 75.0% Scouting 36.8%
Musculoskeletal injuries in young ballet dancers [115]	_	Female 5.3% Male 5.1%

Low back pain among Italian rowers: A cross-sectional survey [116]		a lifetime 64.7% 1-year prevalence 40.6%
The prevalence, incidence and severity of low back pain among international-level rowers [117]	Incidence per 12 months: 1.67 episodes per 1000 h of rowing exposure	12 Month P: from 6% to 25% throughout the year
Life history and point prevalence of low back pain in pre-professional and professional dancers [118]	_	Lifetime p.: 74%
Prevalence of low back pain in adolescent athletes - an epidemiological investigation [119]	_	Point prevalence of 14 %, 1-year prevalence of 57 % Lifetime prevalence of 66 %
Back and neck pain in triathletes [120]	_	Lifetime Prevalence 67.8%
Low back pain status of female university students in relation to different sport activities [121]		Lifetime prevalence 59.7%Point prevalence 17.8% Variables A. Basketball (n = 140) B. Volleyball (n = 114) C. Futsal (n = 136) D. Tennis (n = 85) E. Badminton (n = 125) F. Swimming (n = 138) G. Track andfield (n = 121) H. Shooting (n = 91) I. Karate (n = 109) L. All (n = 1059)
		Point prevalence A. 22.9 % B. 20.2 % C. 16.9 % D. 18.8 % E. 12.8 % F. 18.1% G. 14.9% H. 9.9%

		I. 24.8% L.17.8%
		1 year prevalence A. 47.9% B. 40.0% C. 36.0% D. 30.6% E. 42.4% F. 34.1% G. 41.3% H. 29.7% I. 44.0% L. 39.0%
	_	Life-time prevalence A. 68.6% B. 63.2% C. 54.4% D. 52.9% E. 62.34% F. 47.8% G. 66.9% H. 50.5% I. 67.9% L. 59.7%
Overuse injuries in professional road cyclists [122]	_	12 month prevalence: 58%
Low back pain in childhood and adolescence: assessment of sports activities [123]	_	Prevalence of all sport group 34.9% Swimming 27.5% Basketball 37.9% Soccer 34.9% Baseball 37.5% Tennis 34.3% Wind-instrument music 37.3% Table tennis 34.7% Volleyball 46.6% Athletics 48.6%

		Kendo 35.5% Karate 31.9 % Badminton 39.8% Ballet 30.3% Dance 34.7% Judo 51.1% Gymnastics 36.3% Golf 51% Dodgeball 32.6 % Rugby 51.4 % Sumo wrestling, wrestling 35.4 % Archery 39.1%
Age-related progressive increase of lower back pain among male dance sport competitors [124]	_	Junior 36.2% senior I 54.9% Senior II 63.4%
Relationship between low back pain and competitive sports activities during youth [125]		Lifetime 61.6%
Musculoskeletal pains in relation to different sport and exercise activities in youth [126]		Female gymnastic lifetime prevalence 53,4%, Male ice sports lifetime prevalence 37,2%
Youth baseball players with elbow and shoulder pain have both low back and knee pain: a cross-sectional study [127]		Point prevalence 8.4 %
The prevalence of low back pain among former elite cross-country skiers, rowers, orienteers, and nonathletes: a 10-year Cohort study [128]		Skiing: lifetime prevalence 69%, 1 year 55%, 1 week 17% Rowing: lifetime 68%, 1 year 57%, 1 week 19%, Orienteering: lifetime 61%, 1 month 49%, 1 week 18%
The NLstart2run study: Incidence and risk factors of running-related injuries in novice runners [129]	6 Weeks incidence 3.2%	

Low back pain in elite cross-country skiers. A retrospective epidemiological study [130]	Lifetime prevalence 64%, Men 68% - Women 59%
Back pain in intercollegiate rowers [131]	Point prevalence 32.5, males 31.7%, Females 32.9%
Lumbar intervertebral disk degeneration in athletes [132]	Baseball lifetime 89.5, 1-month 30,8, Swimming lifetime 76,1, - month 36,1 Basketball lifetime 81,0, 1-month 17,7 Kendo lifetime 84,3, 1-month 20,9 Soccer lifetime 76,6, - month 25,0 Running lifetime 90,7 1-month 36,9
Musculoskeletal injuries in auto racing: a retrospective study of 137 drivers [133]	Point prevalence 26%
Self-reported prevalence, pain intensity and risk factors of low back pain in adolescent rowers [134]	Lifetime prevalence Males 93,8%, Females 77,9% - Point prevalence males 64,6%, Females 52,8%
Prevalence and risk factors of low back pain among undergraduate students of a sports and physical education institute in Tunisia [135]	Point prevalence: Gymnastics 16,6%, Judo 15,5%, Handball 14,9%, Volleyball 12,4% Basketball 8,1% Athletics 7,1% soccer 4,1% Weightlifting 4,1% Swimming 1,6%
Low-back problems in recreational self-contained underwater breathing apparatus divers: prevalence and specific risk factors [136]	1-year prevalence 50.3%, Lifetime prevalence 55.8%
Low back pain and other overuse injuries in a group of Japanese triathletes [137]	Males: lifetime 64%, 1 year 33%, 1 month 21%, point 13% - Females: lifetime 41%, 1 year 27%, 1 month 14%, point 9%

Body mass, nonspecific low back pain, and anatomical changes in the lumbar spine in judo athletes [138]		Lifetime prevalence 35.4%, Lightweight 34.5%, middleweight 32.3%, heavyweight 40.9%
Low back pain among endurance athletes with and without specific back loading--a cross-sectional survey of cross-country skiers, rowers, orienteers, and nonathletic controls [139]		Skiing Lifetime 65.4%, One year 63,0%, 7 days 24,1% - Rowing lifetime 63,3%, one year 55,3%, 7 days 25,3% - Orienteering Lifetime 57,3%, one year 49,8%, 7 days 19,4%
Disc degeneration on MRI is more prevalent in young elite skiers compared to controls [140]		lifetime prevalence 50%
Risk factors for non-specific low back pain in schoolchildren and their parents: a population-based study [141]		Lifetime and point prevalence (7 days) of LBP (50.9% in boys vs. 69.3% in girls, and 17.1% in boys vs. 33.0% in girls, respectively),
Effect of pre-existing back pain on the incidence and severity of back pain in intercollegiate rowers[142]	5 years incidence 36.6%	Lifetime prevalence 57.1%
Is active participation in specific sport activities linked with back pain? [143]		Year prevalence: Gymnastics 32% Rhythmic gymnastics: 40% Soccer:38% Ball games:42% Swimming: 42% Badminton/tennis: 39% Horseback riding: 52% Running: 41% Cycling: 35% Roller skating/skateboarding: 35% Martial arts 16%
Injury patterns in elite preprofessional ballet dancers and the utility of screening programs to identify risk characteristics [144]	1 year incidence 9.4%	

The experience of back pain in young Australians [145]		Lifetime prevalence gymnastic males 67% Females 64%, one year prevalence gymnastic males 50% Females 36% , Lifetime prevalence dancing males 59%, Females 49%, one year prevalence dancing males 47%, Females 32%
Joint pain and osteoarthritis in former recreational and elite cricketers [146]		1 month prevalence 14%,
Injuries among world-class professional beach volleyball players. The Fédération Internationale de Volleyball beach volleyball injury study [147]		Point prevalence 9.5%, male 7.6% female 10,2%
Low back pain and physical exercise in leisure time in 38-year-old men and women: a 25-year prospective Cohort study of 640 school children [148]		1-year prevalence Gymnastic 22%, ball games 30%, swimming 16%, running 21% , tennis/badminton 31%
Incidence and risk factors of running-related injuries during preparation for a 4-mile recreational running event [149]	2-months incidence: 3%male, 8% female	
Influence of saddle type upon the incidence of lower back pain in equestrian riders [150]		Lifetime prevalence 48%, 47% of males, 72% female
Low Back Pain in School-Aged Martial Arts Athletes in Japan: A Comparison among Judo, Kendo, and Karate [151]		Point prevalence 4.8%, point prevalence judo 6.9%, point prevalence kendo, point prevalence in karate 2.9%
Back Pain Prevalence and Its Associated Factors in Brazilian Athletes from Public High Schools: A Cross-Sectional Study [152]		Three months prevalence: Handball 55.9% Volleyball 47.4% Soccer 38.9% Basketball 35,5%
Evaluation of factors associated with severe and frequent back pain in high school athletes [153]		3 months prevalence 41.3%reported experiencing BP in the previous 3 months- Handball 33.3%, soccer 35.7%, Basketball 54.5, Volleyball 46.7%

Musculoskeletal predictors of non-contact injury in cricketers - Few and far between? A longitudinal Cohort study [154]	Season incidence 13,4%	
Injuries in students of three different dance techniques [155]	3-years incidence: modern 8.70%, Mexican folkloristic 9.09%, Spanish 16.21 %	
Low back pain in a Cohort of 622 Tunisian schoolchildren and adolescents: an epidemiological study [156]		Cumulative lifetime prevalence was 28.4%, point prevalence 13%, rates occasional 47%, frequent 24% and chronic 29%. cumulative prevalence rate of chronic LBP 8%
Symptoms of musculoskeletal disorders in stage rally drivers and co-drivers [157]		Lifetime prevalence =70%, divers 73%, codrivers 67%
Musculoskeletal screening as a predictor of seasonal injury in elite Olympic class sailors [158]	Season incidence 23%	
Assessment of musculoskeletal pain in dance focusing on dance-style related differences [159]		Ballet 1 year prevalence 53%, 3 months prevalence 40,4% Jazz/modern/ contemporary dance 1 year prevalence 58%, 3 months prevalence 53,7%
Lower limb and back injury patterns of elite netball players [160]		Point prevalence: 13.5%
High Prevalence of Disc Degeneration and Spondylolysis in the Lumbar Spine of Professional Beach Volleyball Players [161]		Lifetime 86%, 1-year prevalence 61%, 1 month prevalence 31%
Lifetime musculoskeletal symptoms and injuries among former elite male athletes [162]		Lifetime prevalence: Weightlifters 24%, Soccer players 29%, runners 11%, shooters 28 % Monthly prevalence was more common (43%) among weightlifters
No Pain, No Gain? Prevalence, Location, Context, and Coping Strategies with Regard to Pain Among Young German Elite Basketball Players [163]		7 days prevalence 34,3, male 28%, female 49%- 1 year prevalence 70,9

High prevalence of low back pain among young basketball players with lower extremity pain: a cross-sectional study [164]		Point prevalence 12.8%, point prevalence Male 46.1%, Point prevalence female 53.9%
A history of low back injury is a risk factor for recurrent back injuries in varsity athletes [165]	5 years incidence = 18.3%, Baseball-M 14.3%, Basketball-M 31,6%, Basketball-W 21,4%, Crew-M 20.0%, Crew-W 12.9% Cross country-W 8.3% Fencing-W 17.6% Field hockey-W 13.0% Football-M 26.8% Golf-M 18.2% Golf-W 22.2% Gymnastics-W 36.4% Ice hockey-M 13.8% Ice hockey-W 11.1% Lacrosse-M 26.7% Lacrosse-W 13.3% Soccer-M 17.2% Soccer-W 4.8% Softball-W 14.3% Swimming-M 2.9% Swimming-W 13.0% Tennis-M 12.5% Tennis-W 40.0% Track-M 15.4% Track-W 13.0% Volleyball-W 22.2%	
Nonspecific Low Back Pain among Kyokushin Karate Practitioners [166]		Point prevalence: 55%, men 42%, women 13%, prevalence under 20y.o. =2%, prevalence 20-25 y.o.= 20 %, prevalence 26-30 19%, prevalence over 30 y.o. 14%
Incidence of back pain in adolescent athletes: a prospective study [167]	1 Year incidence: Males 7% Females 12%"	

Low Back Pain Among Weightlifting Adolescents and Young Adults [168]		Lifetime =70%
The prevalence of musculoskeletal pain and use of painkillers among adolescent male ice hockey players in Finland [169]		Study 54% Control 35% at least once a month Study= 82% Control = 72%
Lumbar Multifidus Muscle Characteristics, Body Composition, and Injury in University Rugby Players [170]		3-months prevalence 41,17
Overuse Injuries in Professional Ballet: Injury-Based Differences Among Ballet Disciplines [171]		Total 5.19% Classical 3.95%, Contemporary 8.26%, Spanish 4.13%, Neoclassical 3.33%
Low back pain among Italian runners: A cross-sectional survey [172]		1 year 22,57 % 1-3 days 11,46% 3-7 days 6,06% 7-10 days 1,54% more than 10 days 3,51%
Prevalence and Consequences of Injuries in Powerlifting: A Cross-sectional Study [173]		Women point prevalence 22,9% year 33,2% Man point prevalence 41,7% Year 40%
Analysis of Postural Risk and Pain Assessment in Bharatanatyam Dancers [174]		Point 55%
Mechanical lower back pain and sacroiliac joint dysfunction in golfers at two golf clubs in Durban, South Africa [175]		Point 45%
Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players [176]		Point prevalence 27.5 %

A preliminary study to investigate the prevalence of pain in elite dressage riders during competition in the United Kingdom [177]		Lifetime prevalence 76%
Lower extremity and spine pain in cyclists [178]		Year prevalence 33%
Elite level rhythmic gymnasts have significantly more and stronger pain than peers of similar age: a prospective study [179]		Study= point 25% Control = point 9,1 %
Non-specific low back pain in male professional football players in the Turkish super league [180]		Prevalence of 31.4%. Average pain intensity in last year was 4.87 VAS Goalkeeper 33.3 % Defender 26.4 % Midfielder 36.5 % Forward 24 %
Musculoskeletal disorders (MSDs) in dancers and former dancers participating in the largest dance festival in the world [181]		Absolute frequency 68% - female 52; Male 16 Severe pain relative frequency 47.1%
Determining the prevalence and causes of sport injuries among female volleyball players of Iran super league [182]		Point 35.65%
Multifidus muscle size and symmetry among elite weightlifters [183]		Point prevalence 83,87 % VAS score of 5.9 and the mean duration of pain was 8.5 months.
Prevalence of injuries in triathletes from a French league [184]		One Year 13.3%
Epidemiology of musculoskeletal injuries among elite biathletes: A preliminary study [185]		One year 16,24 %
Prevalence of low back pain in former rhythmic gymnasts [186]		Study = 36,6% continuous pain 52,2% of cases Control = 46,6% Continuous pain 18,2 % of cases

Low back pain in competitive rhythmic gymnasts [187]		Study = 10,7%Control = 26%
Comparing injuries of spin bowling with fast bowling in young cricketers [188]	Incidence 0.029% per 1000 balls throwed	11.9% in 6-months
Musculoskeletal pain in elite competitive male swimmers [189]		Point prevalence 18.4%
Injuries in Young Female Elite Gymnasts [190]		Lifetime: 34%
Epidemiology and pain in elementary school-aged players a survey of Japanese badminton players participating in the national tournament [191]	0,08% per 1000h training	Male 43,8 % Female 56,3%
Is average club head speed a risk factor for lower back injuries in professional golfers? A Retrospective case control study [192]		Lifetime 38,9%
Prevalence of sports injuries and chronic pain in athletes practicing kickboxing and taekwondo [193]	Kickboxing 0.25 ±0.65 Taekwondo 0.57 ±0.77	
Association between adolescent sport activities and lumbar disk degeneration among young adults [194]		Lifetime prevalence =54% Males = 37% Female= 52%
Epidemiology of Overuse Injuries in Youth Team Sports: A 3-year Prospective Study [195]	Basketball = 1,51 on 1 000 h of exposure Floorball= 1,61 on 1 000 h of exposure	
Back pain and MRI changes in the thoraco-lumbar spine of young elite Mogul skiers [196]		Study = 50% Control = 45%

Mechanical low back pain in elite track and field athletes, an observational Cohort study [197]		Sprinters 36.9% throwers 26.2% Jumpers 36.9%
Analysis of running related injuries, the Vienna study [198]		Point prevalence 10.1 Female 9.6Male10.7
Injuries to elite rowers over a 10-yr period [199]		Females 10 years prevalence 15.2% Males 10 years prevalence 25.0%
Cross sectional associations between the diversity of sport activities and the type of low back pain in adulthood - Kaartinen – 2019 [200]		Point prevalence males 25.8% vs. Females 16.7%
Neck pain and low back pain in relation to functional disability in different sport activities [201]		Football: Point 6,61 - 1year 22,05 - Lifetime 38,23 Volleyball: Point 23,45 - 1 year 40,74 - lifetime 67,90 Wrestling: point 10,14 - 1 year 8,69 - Lifetime 10,14 Basketball: Point 25,00 - 1 year 50,00 - Lifetime 63, 46
Sport-specific Risk and Protective Factors for Low Back Pain in Olympic Class sailors and epidemiologic analytic Cohort study - Hunt 2016 [202]	Incident LBP developed in 22 (14%), 82% of the 22 hikers.	
The relationship between low back pain and sport practice in young people -Vidal-Conti [203]		32.8% boys, girls 45.8% Rhythmic gymnastics 47.8% Volleyball 47.4% Handball 45.7% Cycling 43.1% Swimming 42.9% Tennis 41.5% Athletics 40.9% Basketball 37.4% Futsal 36.6% Football 30.5% Gymnastics 19.2% Martial arts 35.4%

Discussione

Obiettivo di questo studio era analizzare la prevalenza e l'incidenza del LBP nelle popolazioni di atleti che partecipano ad attività sportive differenti, di ogni sesso ed età.

Dagli studi che sono stati analizzati è possibile vedere come la presenza della problematica sia stata ampiamente indagata nel corso degli anni, in particolare nelle popolazioni di atleti giovani e adulti, professionisti e amatori. Le prevalenze estratte dagli articoli hanno generalmente valori più bassi rispetto a quelle degli adulti, questo si spiega sia per il livello di gioco, che è più ricreazionale, piuttosto che professionista; sia perché molti articoli parlano di prevalenza Lifetime, ossia una prevalenza di dolore alla schiena avuto almeno una volta nella vita.

I dati estratti dalle tabelle di contingenza possono essere visti sotto diversi punti di vista, consideriamo per cominciare l'età dei soggetti. Per quello che abbiamo potuto vedere in letteratura non esiste uno studio che abbia preso in considerazione tutte le fasce di età degli sportivi. Eppure, la letteratura è ricca di dati sui più giovani [39], gli adolescenti e i bambini sono stati spesso indagati sulla correlazione tra LBP e sport. Trentanove studi inclusi in questa revisione prendono in esame una popolazione che va tra gli 8 e i 18 anni. Quindi bambini e adolescenti in età scolare che fanno attività fisica a diversi livelli. Il design degli studi selezionati è stato cross-sectional in 25 casi, studio di coorte prospettico in 7 casi e studio di coorte retrospettivo in 3 casi; in ultimo sono stati reperiti 4 case-control study. Gli sport indagati da questi studi sono più di 20 e vanno dal Tiro con l'arco fino al wrestling, i più rappresentati sono il Football (o soccer), Il nuoto (swimming), il basketball, il volleyball e la ginnastica (Gymnastics). La lifetime prevalence si attesta tra un minimo del 9% [40] fino ad un massimo del 93% [41]. Negli sport maggiormente rappresentati si attesta intorno al 30-38% nel Football; al 37.5% nel Basket; al 47% nel Volleyball, tra il 40 e il 67% nella Ginnastica e intorno al 27% nel nuoto [42] [43]. La Point Prevalence si attesta tra un minimo di 8.4% [44] ad un massimo del 83% [45]. Negli sport più rappresentati possiamo indicare nel Football 11-19%, nel Volleyball dal 9.5% al 23%, nel Basketball al 25%. Questi risultati ci fanno vedere come sia sport con contatto come il Football, sia sport da non contatto come il volley abbiano alte percentuali di LBP. La stessa considerazione si può fare per le superfici di gioco, dalla terra del tennis, all'erba del football, non ci sono sostanziali differenze. Interessante è l'articolo di Aoki, 2010 [46] che compara le superfici di gioco nel Soccer, erba naturale contro erba artificiale. Trovando una percentuale maggiore di LBP in atleti che si allenano e giocano sull'erba artificiale (42.3% contro 33.3% dell'erba naturale). Gli studi sono piuttosto vari e prendono in considerazione sia adolescenti con un impegno semi-professionistico, sia attività sportive ricreazionali. In tutti gli studi visionati il LBP è sempre stato ben rappresentato ed identificato come una delle problematiche che portano al maggior tempo di time-loss injuries già a questa età [42], gli adolescenti si fermano in media 7 giorni dalla attività sportiva.

Inoltre, vengono riportati dati di perdita di giorni di scuola a seconda della severità del LBP [47], Hanhai indica in media una perdita di tre giorni di scuola per ogni alunno colpito da LBP durante attività sportiva. Interessante è la differenza tra maschi e femmine. Diversi sono gli articoli che prendono in considerazione questo campo, ma mai con risultati significativi a parità del campione della popolazione presa in esame. Nonostante questo, c'è un lieve sbilanciamento a favore delle femmine adolescenti, che provano più frequentemente dolore rispetto ai maschi loro pari età, maschi: 43,8 % femmine 56,3% [48]. Mentre la point prevalence si attesta intorno al 7.6% nei maschi e al 10,2 nelle ragazze% [49]. L'incidenza del LBP è molto meno studiata negli adolescenti, dei 40 articoli selezionati in questa popolazione solo 5 riportano dati di Incidenza. Il dato passa da un 9.4% [50] al 44% [51]. Negli sport maggiormente rappresentati l'Incidence rate per 1000 physical activity units risulta essere: Basketball 1.58, Gymnastics 1.25, Handball 0.31, Swimming 0.30, Football 0.20. [52] Il tasso di incidenza risulta molto più alta in sport in cui c'è attività di salto ripetuta o movimenti in iperestensione della colonna, vedi la Ginnastica e Basket. Questi due movimenti vengono considerati nello studio di Franz et all (2016) [52], fattori di rischio per lo sviluppo del LBP. La prevalenza nel corso della vita di alcune popolazioni di atleti ad alto livello si avvicina alla totalità dei campioni presi in esame, negli sport da contatto questo valore sembra mantenersi elevato. Prendendo in considerazione sport di combattimento come il Jiu-Jitsu, il Karate, il Wrestling, il

Kendo la prevalenza nel corso della vita varia da 91.2% al 69,7% [53], nel Judo, altro sport caratterizzato da combattimento a contatto e rapidi movimenti del tronco, la prevalenza annuale di LBP si attesta a 91,2%, mentre la prevalenza ogni anno risulta il 79,4% dei praticanti.[54] Negli sport di squadra con elevati scontri fisici, in cui il gioco prevede elevato contatto, come l'Hockey, il Rugby, il Football americano e la Pallamano si riscontrano valori di prevalenza egualmente molto elevati, compresi tra 86.2% - 64% della popolazione nella vita e 83.9% - 70% considerando il valore in un anno. Alcuni sport si compongono di atleti di un sesso prevalentemente, con una chiara influenza sulla letteratura scientifica disponibile a riguardo, con quasi-esclusiva presenza nei cluster del sesso prevalente. Risulta dunque difficile considerare questi dati a paragone di altri, specialmente per quanto riguarda sport come la ginnastica ritmica, molto indagata nella popolazione femminile in quanto considerata fattore di rischio elevato per lo sviluppo di LBP specialmente nelle categorie competitive. Gli studi riportano una prevalenza lifetime di 93.8% e prevalenza annuale del 73.3. Al contrario, i vogatori costituiscono una popolazione ampiamente sbilanciata verso il sesso maschile, con la maggioranza degli studi che indagano la presenza di questa problematica all'interno dei College che partecipano a competizioni di alto livello. Nei vogatori (Rowers) la prevalenza nel corso della vita raggiunge 96.4% degli atleti in alcuni studi, con prevalenza annuale stimata tra 95.2% e 57%, mentre la prevalenza settimanale di questi atleti è intorno al 19%. Ad oggi in letteratura viene spesso indicato come uno degli sport con prevalenza più elevata ed un potenziale fattore di rischio per lo sviluppo di LBP. Gli sport di squadra più indagati per la presenza della problematica sono la pallacanestro (Basketball), la pallavolo (Volleyball), il Cricket, il Baseball, e il calcio (Football), probabilmente dovuto alla loro popolarità ed elevata diffusione per il mondo, prendendo in considerazione spesso anche una grande quantità di atleti non professionisti. La pallacanestro sembra essere uno sport molto equilibrato in termini di partecipazione, presenta campioni spesso composti da alti numeri di partecipanti di entrambi i sessi e viene descritto come causa frequente di insorgenza di LBP in chi lo pratica, probabilmente a causa dell'elevato numero di salti e atterraggi. La prevalenza lifetime è stata ritrovata in letteratura compresa tra 54% e 37,4%, con una prevalenza puntuale del 25% e prevalenza ad un anno del 50%. Altro sport molto popolare, ma meno bilanciato per quanto riguarda la distribuzione maschi/femmine è la pallavolo, ampiamente descritto in letteratura come sport ad alta prevalenza di LBP. Nella pallavolo la prevalenza nella vita delle atlete risulta compresa tra 91,7 e 47.5%, con il 40,8% di atlete che ne soffre ogni anno; negli studi risulta anche una prevalenza puntuale di 23,45%. Alcuni studi hanno preso in esame anche il Beach-volley, sport con meccanica di gioco del tutto simile che differisce per numerosità della squadra e terreno di gioco, mostrando una prevalenza più elevata che nella pallavolo, con valori di prevalenza nel corso della vita del tutto paragonabili, mentre una prevalenza annuale dell'80%. Il calcio è uno degli sport più indagati dagli studi, i mezzi economici e l'importanza delle strutture mediche delle squadre di elite della lega Europea di calcio (UEFA) hanno avviato una serie di studi per indagare prevalenza e incidenza degli infortuni nel calcio, al fine di ridurre gli stessi tramite una prevenzione mirata. [53] Anche il LBP rientra tra gli infortuni studiati, l'incidenza è stata studiata proprio dalla Uefa tramite uno studio di prospettico che ha indagato i migliori 25 club del football europeo per 10 anni, prendendo in considerazione 1357 giocatori. Le squadre sono state divise in due gruppi secondo la differenza regionale, la metà proveniva dal nord Europa e una metà dal sud Europa. L'incidenza trovata è stata minore nel gruppo del sud Europa (0.10 contro 0.20 x 1000 h di exposure). [54] l'autore spiega la possibile differenza tramite la differenza di clima o di nutrizione tra i due gruppi, ma conclude che dovrebbero essere condotti studi più approfonditi. Il dato medio di lifetime prevalence nei calciatori di elite si attesta intorno al 60%, mentre la 12-month prevalence intorno al 56.9%. [55] i carichi di allenamento e le competizioni ricorrenti potrebbero, secondo l'autore, essere in parte causa della alta prevalenza del LBP. Lo studio di n=116 riguarda invece il LBP in calciatori professionisti della prima divisione turca, la Prevalence si attesta a 31.4%. i dati più interessanti però riguardano la posizione in campo (Goalkeeper 33.3 % Defender 26.4 % Midfielder 36.5 % Forward 24 %) con una netta prevalenza a favore del portiere e dei centrocampisti nel soffrire di Lombalgia. All'interno di questo studio le discipline di danza, come il balletto, la danza contemporanea, pop, jazz, moderna ecc. sono state considerate attività sportive a tutti gli effetti, considerando che gli stessi studi tendono ad analizzare danzatori professionisti e semi-professionisti. Da questi l'incidenza del LBP nelle scuole professionistiche di diversi stili di danza risulta di 9.4% all'anno. Ballerine professioniste rispetto alle amatrici hanno una prevalenza nel corso della vita molto più elevata, che si attesta al 74%, decisamente maggiore se paragonato alla prevalenza del 41% delle non-professioniste.

Un altro sport spesso descritto dalla letteratura come fattore di rischio risulta essere il sollevamento pesi. Anche in questo caso la differenza tra studi che ricercavano la prevalenza nel corso della vita di LBP nelle popolazioni di atleti professionisti ha registrato valori molto più elevati. In questo caso la prevalenza negli atleti professionisti risulta l'82.9%, con prevalenza annuale di 71,4% mentre la prevalenza a nei non professionisti risulta più bassa, 58.8%. Molti studi in letteratura analizzano la presenza del LBP nello sci di fondo, considerato un altro sport ad alta prevalenza per il LBP. I dati che emergono da questa revisione sono in linea con altri già presenti in letteratura e indicano una prevalenza del 87.8% - 69%, con prevalenza a 1 anno compresa tra 73.5% e 55%.

Conclusioni

La letteratura scientifica presenta un ampio spettro di risultati che mettono in luce l'interesse nell'indagare i fattori di rischio collegati alla partecipazione sportiva a tutti i livelli e a tutte le età. Il principale limite in questo studio è rappresentato dalla varietà di condizioni, fattori confondenti come il setting, le ore di allenamento, i livelli di gioco, le condizioni del terreno e il ruolo in squadra. Esiste inoltre la necessità di sottolineare che, seppure gli studi siano stati attentamente selezionati al fine di escludere la valutazione di condizioni differenti dal LBP aspecifico, la terminologia negli studi è risultata estremamente eterogenea. Una ridotta minoranza degli studi presentano una definizione chiara e apertamene esplicitata della condizione indagata, sottolineando la necessità dell'utilizzo di una terminologia condivisa. Alla luce dei dati raccolti i valori epidemiologici del LBP nella popolazione sportiva appaiono moderati se confrontati a quelli della popolazione generale. La letteratura è concorde [56] [57] [58] nell'indicare l'attività fisica e la partecipazione sportiva in generale come fattori protettivi nei confronti dello sviluppo di LBP, oltre che come componenti della terapia. Nonostante questo, dai dati raccolti sembrano possibili alcune correlazioni nello sviluppo della problematica associate a popolazioni specifiche, come gli atleti di alto livello che, condizionati dalla necessità della prestazione, sottopongono il proprio corpo a dosi di allenamento e sforzo fuori scala per essere paragonato ad una popolazione non-elite. Il tema risulta già noto in letteratura [59], anche se ulteriori studi sono necessari per stabilire reazioni di causalità e migliorare la capacità di distinguere fattori di rischio legati allo sport.

Appendice

Tab. 4 – Strategia di costruzione della stringa di ricerca Pubmed.

Problem / Pathology	
All field	"Low Back Pain"
MeSH Therm	**"Low Back Pain"**
All Fields	Lumbago
All Fields	"Lower Back Pain"
All Fields	"Low Back Ache"
All Fields	"Postural Low Back Pain"
All Fields	"Mechanical Low Back Pain"
All Fields	"Low Backache"
All Fields	"Low Back Pains"
All Fields	"Back Pain"
MeSH Therms	**"Back Pain"**
All Fields	"Back Pains"
All Fields	Backache
All Fields	"Back Ache"
All Fields	Backaches
All Fields	"Back Aches"
All Fields	"Vertebrogenic Pain Syndrome"

Outcome	
All Fields	Incidence
MeSH Therm	**Incidence**
All Fields	Incidences

All Fields	"Secondary attack rate"
All Fields	Attack Rate
All Fields	Prevalence
MeSH Therm	**Prevalence**
All Fields	Prevalences
All Fields	"Period prevalence"
All Fields	"Point prevalence"
All Fields	Morbidity
MeSH Therm	**Morbidity**

Exposure / Risk Factor	
All Fields	Sports
MeSH Therm	**Sports**
All Fields	Sport
All Fields	Athletics
All Fields	Athletic
All Fields	Baseball
MeSH Therm	**Baseball**
All Fields	Softball
All Fields	Softballs
All Fields	Baseballs
All Fields	Basketball
MeSH Therm	**Basketball**
All Fields	Basketballs
All Fields	Netballs
All Fields	Netball

All Fields	Bicycling
MeSH Therm	**Bicycling**
All Fields	Boxing
MeSH Therm	**Boxing**
All Fields	Boxings
All Fields	“Cricket Sport”
MeSH Therm	**“Cricket Sport”**
All Fields	“Cricket Sports”
All Fields	Football
MeSH Therm	**Football**
All Fields	Footballs
All Fields	Rugby
All Fields	Rugbies
All Fields	Golf
MeSH Therm	**Golf**
All Fields	Golfs
All Fields	Gymnastics
MeSH Therm	**Gymnastics**
All Fields	Calisthenics
All Fields	Hockey
MeSH Therm	**Hockey**
All Fields	Hockeys
All Fields	“Ice Hockey”
MeSH Therm	**“Ice Hockeys”**

All Fields	“Field Hockey”
All Fields	“Field Hockeys”
All Fields	“Martial Arts”
MeSH Therm	**“Martial Arts”**
All Fields	“Hap Ki Do”
All Fields	Judo
All Fields	Karate
All Fields	Jujitsu
All Fields	“Tae Kwon Do”
All Fields	Aikido
All Fields	Wushu
All Fields	“Kung Fu”
All Fields	“Gong Fu”
All Fields	Gongfu
All Fields	“Tai Ji”
MeSH Therm	**“Tai Ji”**
All Fields	Tai-Ji
All Fields	“Tai Chi”
All Fields	“Tai Ji Quan”
All Fields	Taiji
All Fields	Taijiquan
All Fields	“T’ai Chi”
All Fields	“Tai Chi Chuan”
All Fields	Mountaineering
MeSH Therm	Mountaineering
All Fields	Mountaineerings
All Fields	“Racquet Sports”
MeSH Therm	**“Racquet Sports”**

All Fields	“Racquet Sport”
All Fields	“Racket Sports”
All Fields	Squash
All Fields	Racquetball
All Fields	Racketball
All Fields	Badminton
All Fields	Lacrosse
All Fields	Tennis
MeSH Therm	**Tennis**
All Fields	Running
MeSH Therm	**Running**
All Fields	Runnings
All Fields	Jogging
MeSH Therm	**Jogging**
All Fields	Joggings
All Fields	“Marathon Running”
MeSH Therm	**“Marathon Running”**
All Fields	Marathons
All Fields	Marathon
All Fields	“Ultramarathon Running”
All Fields	Skating
MeSH Therm	**Skating**
All Fields	Skatings
All Fields	Skateboarding
All Fields	Skateboardings
All Fields	“Ice Skating”
All Fields	“Ice Skatings”
All Fields	“Snow Sports”

MeSH Therm	**“Snow Sports”**
All Fields	“Snow Sport”
All Fields	Snowmobiling
All Fields	Sledding
All Fields	Skiing
MeSH Therm	**Skiing**
All Fields	“Snow Skiing”
All Fields	“Snow Skiings”
All Fields	Snowboarding
All Fields	Soccer
MeSH Therm	**Soccer**
All Fields	“Team Sports”
MeSH Therm	**“Team Sports”**
All Fields	“Team Sport”
All Fields	“Track and Field”
MeSH Therm	**“Track and Field”**
All Fields	“Field and Track”
All Fields	Track
All Fields	Tracks
All Fields	Volleyball
MeSH Therm	**Volleyball**
All Fields	Volleyballs
All Fields	“Water Sports”
MeSH Therm	**“Water Sports”**
All Fields	“Water Sport”
All Fields	“Wave Surfing”
All Fields	Rowing
All Fields	“Water Polo”
All Fields	Kayaking

All Fields	Canoeing
All Fields	Boating
All Fields	Surfboarding
All Fields	“Water Skiing”
All Fields	Swimming
MeSH Therm	**Swimming**
All Fields	“Weight Lifting”
MeSH Therm	**“Weight Lifting”**
All Fields	“Weight Liftings”
All Fields	Wrestling
MeSH Therm	**Wrestling**
All Fields	Wrestlings
All Fields	“Youth Sports”
MeSH Therm	**“Youth Sports”**
All Fields	“Youth Sport”
All Fields	“Adolescent Sport”
All Fields	“Children Sports”
All Fields	“Children’s Sport”
All Fields	“Childrens Sports”
All Fields	“Organized Youth Sport”
All Fields	Dancing
MeSH Therm	**Dancing**
All Fields	Dance
All Fields	Ballet
All Fields	“Square Dance”
All Fields	“Hip Hop Dance”
All Fields	“Hip-Hop Dance”
All Fields	“Jazz Dance”
All Fields	“Tap Dance”

All Fields	“Modern Dance”
All Fields	“Salsa Dancing”
All Fields	“Line Dancing”
All Fields	Athletes
MeSH Therm	**Athletes**
All Fields	Athlete
All Fields	“Professional Athletes”
All Fields	“Professional Athlete”
All Fields	“Elite Athlete”
All Fields	Surf
All Fields	"American Football"
All Fields	"Sailing Sports"
All Fields	Sailing
All Fields	Parachuting
All Fields	“Rhythmic gymnastics”
All Fields	“Road cycling”
All Fields	“Australian football”
All Fields	Handball
All Fields	“Field hockey”
All Fields	“Scuba Diving”
All Fields	Skydiving
All Fields	Biathlon
All Fields	“Canoe Racing”
All Fields	Tobogganing
All Fields	“Alpine skiing”
All Fields	“Canoe Slalom”
All Fields	“Figure skating”
All Fields	Multi-sport

All Fields	Futsal
All Fields	Shooting
All Fields	Floorball
All Fields	Jiu-jitsu
All Fields	“Speed Skating”
All Fields	Artistic Swimming
All Fields	“Beach Volleyball”
All Fields	Breaking
All Fields	“Canoe Sprinting”
All Fields	“Cycling”
All Fields	“Cycling Road”
All Fields	“Cycling Track”
All Fields	“Cycling Mountain Bike”
All Fields	“Cycling BMX”
All Fields	Diving
All Fields	Equestrian
All Fields	Dressage
All Fields	“Horse Riding”
All Fields	Fencing
All Fields	“Gymnastic Artistic”
All Fields	“Gymnastic Rhythmic”
All Fields	“Marathon Swimming”
All Fields	“Pentathlon”
All Fields	Climbing
All Fields	“Climbing Sport”
All Fields	“Table Tennis”
All Fields	“Trampoline”
All Fields	Triathlon
All Fields	“Water Polo”

All Fields	“Wrestling Greco-Roman”
All Fields	“Mixed Martial Arts”

((((((((((((((((("Low Back Pain") OR ("Low Back Pain"[MeSH Terms])) OR (Lumbago)) OR ("Lower Back Pain")) OR ("Low Back Ache")) OR ("Postural Low Back Pain")) OR ("Mechanical Low Back Pain")) OR ("Low Backache")) OR ("Low Back Pains")) OR ("Back Pain")) OR ("Back Pain"[MeSH Terms])) OR ("Back Pains")) OR (Backache)) OR ("Back Ache")) OR (Backaches)) OR ("Back Aches")) OR ("Vertebrogenic Pain Syndrome")) AND ((((((((((((Incidence) OR (Incidence[MeSH Terms])) OR (Incidences)) OR ("Secondary attack rate")) OR (Attack Rate)) OR (Prevalence)) OR (Prevalence[MeSH Terms])) OR (Prevalences)) OR ("Period prevalence")) OR ("Point prevalence")) OR (Morbidity)) OR (Morbidity[MeSHTerms]))) AND ((Sports) OR (Sports[MeSH Terms])) OR (Sport)) OR (Athletics)) OR (Athletic)) OR (Baseball)) OR (Baseball[MeSH Terms])) OR (Softball)) OR (Softballs)) OR (Baseballs)) OR (Basketball)) OR (Basketball[MeSH Terms])) OR (Basketballs)) OR (Netballs)) OR (Netball)) OR (Bicycling)) OR (Bicycling[MeSH Terms])) OR (Boxing)) OR (Boxing[MeSH Terms])) OR (Boxings)) OR ("Cricket Sport")) OR ("Cricket Sport"[MeSH Terms])) OR ("Cricket Sports")) OR (Football)) OR (Football[MeSH Terms])) OR (Footballs)) OR (Rugby)) OR (Rugbies)) OR (Golf)) OR (Golf[MeSH Terms])) OR (Golfs)) OR (Gymnastics)) OR (Gymnastics[MeSH Terms])) OR (Calisthenics)) OR (Hockey)) OR (Hockey[MeSH Terms])) OR (Hockeys)) OR ("Ice Hockey")) OR ("Ice Hockey"[MeSH Terms])) OR ("Field Hockey")) OR ("Field Hockeys")) OR ("Martial Arts")) OR ("Martial Arts"[MeSH Terms])) OR ("Hap Ki Do")) OR (Judo)) OR (Karate)) OR (Jujitsu)) OR ("Tae Kwon Do")) OR (Aikido)) OR (Wushu)) OR ("Kung Fu")) OR ("Gong Fu")) OR (Gongfu)) OR ("Tai Ji")) OR ("Tai Ji"[MeSH Terms])) OR (Tai-Ji)) OR ("Tai Chi")) OR ("Tai Ji Quan")) OR (Taiji)) OR (Taijiquan)) OR ("T’ai Chi")) OR ("Tai Chi Chuan")) OR (Mountaineering)) OR (Mountaineering)) OR (Mountaineerings)) OR ("Racquet Sports")) OR ("Racquet Sports"[MeSH Terms])) OR ("Racquet Sport")) OR ("Racket Sports")) OR (Squash)) OR (Racquetball)) OR (Racketball)) OR (Badminton)) OR (Lacrosse)) OR (Tennis)) OR (Tennis[MeSH Terms])) OR (Running)) OR (Running[MeSH Terms])) OR (Runnings)) OR (Jogging)) OR (Jogging[MeSH Terms])) OR (Joggings)) OR ("Marathon Running")) OR ("Marathon Running"[MeSH Terms])) OR (Marathons)) OR (Marathon)) OR ("Ultramarathon Running")) OR (Skating)) OR (Skating[MeSH Terms])) OR (Skatings)) OR (Skateboarding)) OR (Skateboardings)) OR ("Ice Skating")) OR ("Ice Skatings")) OR ("Snow Sports")) OR ("Snow Sports"[MeSH Terms])) OR ("Snow Sport")) OR (Snowmobiling)) OR (Sledding)) OR (Skiing)) OR (Skiing[MeSH Terms])) OR ("Snow Skiing")) OR ("Snow Skiings")) OR (Snowboarding)) OR (Soccer)) OR (Soccer[MeSH Terms])) OR ("Team Sports")) OR ("Team Sports"[MeSH Terms])) OR ("Team Sport")) OR ("Track and Field")) OR ("Track and Field"[MeSH Terms])) OR ("Field and Track")) OR (Track)) OR (Tracks)) OR (Volleyball)) OR (Volleyball[MeSH Terms])) OR (Volleyballs)) OR ("Water Sports")) OR ("Water Sports"[MeSH Terms])) OR ("Water Sport")) OR ("Wave Surfing")) OR (Rowing)) OR ("Water Polo")) OR (Kayaking)) OR (Canoeing)) OR (Boating)) OR (Surfboarding)) OR ("Water Skiing")) OR (Swimming)) OR (Swimming[MeSH Terms])) OR ("Weight Lifting")) OR ("Weight Lifting"[MeSH Terms])) OR ("Weight Liftings")) OR (Wrestling)) OR (Wrestling[MeSH Terms])) OR (Wrestlings)) OR ("Youth Sports")) OR ("Youth Sports"[MeSH Terms])) OR ("Youth Sport")) OR ("Adolescent Sport")) OR ("Children Sports")) OR ("Children’s Sport")) OR ("Childrens Sports")) OR ("Organized Youth Sport")) OR (Dancing)) OR (Dancing[MeSH Terms])) OR (Dance)) OR (Ballet)) OR ("Square Dance")) OR ("Hip Hop Dance")) OR ("Hip-Hop Dance")) OR ("Jazz Dance")) OR ("Tap Dance")) OR ("Modern Dance")) OR ("Salsa Dancing")) OR ("Line Dancing")) OR (Athletes)) OR (Athletes[MeSH Terms])) OR (Athlete)) OR ("Professional Athletes")) OR ("Professional Athlete")) OR ("Elite Athlete")) OR (Surf)) OR ("American Football")) OR ("Sailing Sports")) OR (Sail)) OR (Parachuting)) OR ("Rhythmic gymnastics")) OR ("Road cycling")) OR ("Australian football")) OR (Handball)) OR ("Field hockey")) OR ("Scuba Diving")) OR (Skydiving)) OR

(Biathlon)) OR ("Canoe Racing")) OR (Tobogganing)) OR ("Alpine skiing")) OR ("Canoe Slalom")) OR ("Figure skating")) OR (Multi-sport)) OR (Futsal)) OR (Shooting)) OR (Floorball)) OR (Jiu-jitsu)) OR ("Speed Skating")) OR (Artistic Swimming)) OR ("Beach Volleyball")) OR (Breaking)) OR ("Canoe Sprinting")) OR ("Cycling")) OR ("Cycling Road")) OR ("Cycling Track")) OR ("Cycling Mountain Bike")) OR ("Cycling BMX")) OR (Diving)) OR (Equestrian)) OR (Dressage)) OR ("Horse Riding")) OR (Fencing)) OR ("Gymnastic Artistic")) OR ("Gymnastic Rhythmic")) OR ("Marathon Swimming")) OR ("Pentathlon")) OR (Climbing)) OR ("Climbing Sport")) OR ("Table Tennis")) OR ("Trampoline")) OR (Triathlon)) OR ("Water Polo")) OR ("Wrestling Greco-Roman")) OR ("Mixed Martial Arts"))

Tab. 5 – Esito della Valutazione del Risk of Bias (RoB).

ARTICOLI	**Valutazione ROB**
Lower Back Injuries in National Collegiate Athletic Association Football Players: A 5-Season Epidemiological Study	GOOD
Back pain in elite sports: A cross-sectional study on 1114 athletes	GOOD
Epidemiology of injury and illness in 153 Australian international-level rowers over eight international seasons	GOOD
Incidence and risk factors for injury in non-elite Australian Football	GOOD
Low back pain in young elite field hockey players, football players and speed skaters: Prevalence and risk factors	GOOD
Significance of lumbar spondylolysis in college football players	MEDIUM
Low back pain in female elite football and handball players compared with an active control group	GOOD
A one-year prospective study on back pain among novice golfers	GOOD
Back pain prevalence in adolescent athletes	GOOD
Incidence and risk factors for back pain in young floorball and basketball players: A Prospective study	GOOD
Association between lower back pain and lower extremity pain among young volleyball players: A cross-sectional study	GOOD
Sports participation and low back pain in schoolchildren	GOOD
Chronic low back pain and disability in Brazilian jiu-jitsu athletes	GOOD

Prevalence of back pain in a group of elite athletes exposed to repetitive overhead activity	GOOD
Upper Extremity Pain Is Associated with Lower Back Pain among Young Basketball Players: A Cross-Sectional Study	MEDIUM
Incidence of injury among adolescent soccer players: a comparative study of artificial and natural grass turfs	GOOD
Injury profile in junior tennis players: a prospective two-year study	GOOD
Habitual and ready positions in female table tennis players and their relation to the prevalence of back pain	POOR
Injuries among young soccer players	MEDIUM
Lower Back Symptoms in Adolescent Soccer Players: Predictors of Functional Recovery	GOOD
Musculoskeletal pain and related risks in skydivers: a population-based survey	GOOD
The club-level road cyclist: injury, pain, and performance	GOOD
Coexistence of Trunk or Lower Extremity Pain with Elbow and/or Shoulder Pain among Young Overhead Athletes: A Cross-Sectional Study	GOOD
Mermaid health - identifying health issues related to mermaiding	GOOD
Incidence rates and characteristics of abnormal lumbar findings and low back pain in child and adolescent weightlifter: A prospective three-year cohort study	POOR
Nonspecific low-back pain in Kuwaiti children and adolescents: associated factors	GOOD
Dancers' perceptions of pain and injury: positive and negative effects	MEDIUM
Back injuries in a cohort of schoolchildren aged 6-12: A 2.5-year prospective study	MEDIUM
Back pain and radiologic changes in the thoraco-lumbar spine of athletes	POOR
Regional differences in injury incidence in European professional football	GOOD

Oral contraceptive use among female elite athletes and age-matched controls and its relation to low back pain	MEDIUM
Prevalence of joint-related pain in the extremities and spine in five groups of top athletes	POOR
Low back pain in junior Australian rules football: a cross-sectional survey of elite juniors, non-elite juniors and non-football playing controls	GOOD
Low back pain status in elite and semi-elite Australian football codes: a cross-sectional survey of football (soccer), Australian rules, rugby league, rugby union and non-athletic controls	GOOD
Relationship between radiographic abnormalities of lumbar spine and incidence of low back pain in high school rugby players: a prospective study	MEDIUM
Lumbar intervertebral disk degeneration in elite competitive swimmers: a case control study	GOOD
Spinal posture, sagittal mobility, and subjective rating of back problems in former female elite gymnasts	GOOD
Musculoskeletal profile of the lumbar spine and hip regions in cricket fast bowlers	GOOD
Evaluation of elite British cyclists: the role of the squad medical	GOOD
Magnetic resonance imaging findings of the lumbar spine in elite horseback riders: correlations with back pain, body mass index, trunk/leg-length coefficient, and riding discipline	GOOD
A retrospective case-control analysis of 2002 running injuries	MEDIUM
Back pain in school children. A study among 1178 pupils	LOW
Self-reported injury patterns among competitive curlers in the United States: a preliminary investigation into the epidemiology of curling injuries	MEDIUM
Epidemiological profile of pain and non-steroid anti-inflammatory drug use in collegiate athletes in the United States	MEDIUM
The spine in sport and veteran military parachutists	MEDIUM
Low Back Pain in Young Basketball and Floorball Players	GOOD
Low back pain in the paediatric athlete	MEDIUM

Epidemiology, clinical characteristics, and severity of gradual onset injuries in recreational road cyclists: A cross-sectional study in 21,824 cyclists - SAFER XIII	MEDIUM
Back Pain in Rowers: A Cross-sectional Study on Prevalence, Pain Characteristics and Risk Factors	GOOD
Motor control and low back pain in dancers	GOOD
Low back pain in competitive rhythmic gymnasts	MEDIUM
The prevalence and impact of low back pain in pre-professional and professional dancers: A prospective study	MEDIUM
Physical activity and low-back pain in schoolchildren	GOOD
Musculoskeletal injuries in young ballet dancers	MEDIUM
Low back pain among Italian rowers: A cross-sectional survey	GOOD
A prospective study of health problems at the 2018 17/U and 19/U Australian National Netball Championships with comparison of surveillance methodology	POOR
Badminton injuries in youth competitive players	POOR
The prevalence, incidence and severity of low back pain among international-level rowers	MEDIUM
Life history and point prevalence of low back pain in pre-professional and professional dancers	MEDIUM
Prevalence of low back pain in adolescent athletes - an epidemiological investigation	GOOD
Back and neck pain in triathletes	GOOD
Severe back pain in elite athletes: a cross-sectional study on 929 top athletes of Germany	GOOD
Low back pain status of female university students in relation to different sport activities	MEDIUM
Overuse injuries in professional road cyclists	GOOD

Low back pain in childhood and adolescence: assessment of sports activities	GOOD
Age-related progressive increase of lower back pain among male dance sport competitors	GOOD
Low back pain among retired wrestlers and heavyweight lifters	POOR
Relationship between low back pain and competitive sports activities during youth	GOOD
Musculoskeletal pains in relation to different sport and exercise activities in youth	GOOD
Youth baseball players with elbow and shoulder pain have both low back and knee pain: a cross-sectional study	GOOD
The prevalence of low back pain among former elite cross-country skiers, rowers, orienteerers, and nonathletes: a 10-year cohort study	GOOD
The NLstart2run study: Incidence and risk factors of running-related injuries in novice runners	GOOD
Low back pain in elite cross-country skiers. A retrospective epidemiological study	GOOD
Back pain in intercollegiate rowers	GOOD
Lumbar intervertebral disk degeneration in athletes	GOOD
Musculoskeletal injuries in auto racing: a retrospective study of 137 drivers	MEDIUM
Self-reported prevalence, pain intensity and risk factors of low back pain in adolescent rowers	MEDIUM
Prevalence and risk factors of low back pain among undergraduate students of a sports and physical education institute in Tunisia	GOOD
Low-back problems in recreational self-contained underwater breathing apparatus divers: prevalence and specific risk factors	MEDIUM
Back injuries and pain in adolescents attending a ski high school	POOR
Low back pain and other overuse injuries in a group of Japanese triathletes	GOOD

Body mass, nonspecific low back pain, and anatomical changes in the lumbar spine in judo athletes	GOOD
Low back pain among endurance athletes with and without specific back loading--a cross-sectional survey of cross-country skiers, rowers, orienteerers, and nonathletic controls	GOOD
Disc degeneration on MRI is more prevalent in young elite skiers compared to controls	MEDIUM
Injuries in runners	POOR
Risk factors for non-specific low back pain in schoolchildren and their parents: a population based study	GOOD
Effect of pre-existing back pain on the incidence and severity of back pain in intercollegiate rowers	MEDIUM
Is active participation in specific sport activities linked with back pain?	GOOD
Injury patterns in elite preprofessional ballet dancers and the utility of screening programs to identify risk characteristics	GOOD
The experience of back pain in young Australians	GOOD
Joint pain and osteoarthritis in former recreational and elite cricketers	GOOD
Injuries among world-class professional beach volleyball players. The Fédération Internationale de Volleyball beach volleyball injury study	GOOD
Low back pain and physical exercise in leisure time in 38-year-old men and women: a 25-year prospective cohort study of 640 school children	GOOD
Incidence and risk factors of running-related injuries during preparation for a 4-mile recreational running event	GOOD
Influence of saddle type upon the incidence of lower back pain in equestrian riders	MEDIUM
Low Back Pain in School-Aged Martial Arts Athletes in Japan: A Comparison among Judo, Kendo, and Karate	GOOD
Back Pain Prevalence and Its Associated Factors in Brazilian Athletes from Public High Schools: A Cross-Sectional Study	GOOD
Evaluation of factors associated with severe and frequent back pain in high school athletes	GOOD

Musculoskeletal predictors of non-contact injury in cricketers - Few and far between? A longitudinal Cohort study	GOOD
Injuries in students of three different dance techniques	MEDIUM
Low back pain in a cohort of 622 Tunisian schoolchildren and adolescents: an epidemiological study	MEDIUM
Symptoms of musculoskeletal disorders in stage rally drivers and co-drivers	GOOD
Injury profiles in elite women's T20 cricket	POOR
Musculoskeletal screening as a predictor of seasonal injury in elite Olympic class sailors	MEDIUM
Injuries and overuse syndromes in powerlifting	POOR
Assessment of musculoskeletal pain in dance focusing on dance-style related differences	GOOD
Lower limb and back injury patterns of elite netball players	GOOD
High Prevalence of Disc Degeneration and Spondylolysis in the Lumbar Spine of Professional Beach Volleyball Players	MEDIUM
Lifetime musculoskeletal symptoms and injuries among former elite male athletes	GOOD
No Pain, No Gain? Prevalence, Location, Context, and Coping Strategies with Regard to Pain Among Young German Elite Basketball Players	GOOD
High prevalence of low back pain among young basketball players with lower extremity pain: a cross-sectional study	GOOD
A history of low back injury is a risk factor for recurrent back injuries in varsity athletes	MEDIUM
Nonspecific Low Back Pain among Kyokushin Karate Practitioners	GOOD
Incidence of back pain in adolescent athletes: a prospective study	GOOD
Low Back Pain Among Weightlifting Adolescents and Young Adults	MEDIUM

The prevalence of musculoskeletal pain and use of painkillers among adolescent male ice hockey players in Finland	MEDIUM
Prevalence of childhood and adolescent soccer-related	POOR
Lumbar Multifidus Muscle Characteristics, Body Composition, and Injury in University Rugby Players	MEDIUM
Overuse Injuries in Professional Ballet: Injury-Based Differences Among Ballet Disciplines	GOOD
Low back pain among Italian runners: A cross-sectional survey	GOOD
THE PREVALENCE OF LOW BACK PAIN IN CRICKETERS - AN undergraduate epidemiological study	POOR
Prevalence and Consequences of Injuries in Powerlifting: A Cross-sectional Study	GOOD
Analysis of Postural Risk and Pain Assessment in Bharatanatyam Dancers	GOOD
Mechanical lower back pain and sacroiliac joint dysfunction in golfers at two golf clubs in Durban, South Africa	GOOD
Epidemiology and prevention strategies for the musculoskeletal injuries in the paddle-tennis senior players	MEDIUM
Musculoskeletal injuries among elite artistic and rhythmic Greek gymnasts: A ten-year study of 156 elite athletes	POOR
A preliminary study to investigate the prevalence of pain in elite dressage riders during competition in the United Kingdom	MEDIUM
Lower extremity and spine pain in cyclists	GOOD
Elite level rhythmic gymnasts have significantly more and stronger pain than peers of similar age: a prospective study	GOOD
Non-specific low back pain in male professional football players in the Turkish super league	GOOD
Musculoskeletal disorders (MSDs) in dancers and former dancers participating in the largest dance festival in the world	GOOD
Determining the prevalence and causes of sport injuries among female volleyball players of Iran super league	MEDIUM

Multifidus muscle size and symmetry among elite weightlifters	GOOD
Prevalence of injuries in triathletes from a French league	MEDIUM
Epidemiology of musculoskeletal injuries among elite biathletes: A preliminary study	MEDIUM
Prevalence of low back pain in former rhythmic gymnasts	GOOD
Low back pain in competitive rhythmic gymnasts	MEDIUM
Comparing injuries of spin bowling with fast bowling in young cricketers	GOOD
Musculoskeletal pain in elite competitive male swimmers	GOOD
Injuries in Young Female Elite Gymnasts	MEDIUM
Epidemiology and pain in elementary school-aged players a survey of Japanese badminton players participating in the national tournament	GOOD
Is average club head speed a risk factor for lower back injuries in professional golfers? A retrospective case control study	GOOD
Women ’s Gymnastics injury	POOR
Prevalence of sports injuries and chronic pain in athletes practicing kickboxing and taekwondo	MEDIUM
Association between adolescent sport activities and lumbar disk degeneration among young adults	GOOD
Epidemiology of Overuse Injuries in Youth Team Sports: A 3-year Prospective Study	GOOD
Back pain and MRI changes in the thoraco-lumbar spine of young elite Mogul skiers	GOOD
Mechanical low back pain in elite track and field athletes, an observational cohort study	GOOD
Analysis of running related injuries, the Vienna study	GOOD

Injuries to elite rowers over a 10-yr period	GOOD
Cross sectional associations between the diversity of sport activities and the type of low back pain in adulthood - Kaartinen - 2019	GOOD
Neck pain and low back pain in relation to functional disability in different sport activities	GOOD
Sport-specific Risk and Protective Factors for Low Back Pain in Olympic Class sailors and epidemiologic analytic cohort study - Hunt 2016	GOOD
The relationship between low back pain and sport practice in young people	GOOD

Tab. 6 - Checklist for Analytical Cross-Sectional Studies. [96]

ROB question
1. Were the criteria for inclusion in the sample clearly defined?
2. Were the study subjects and the setting described in detail?
3. Was the exposure measured in a valid and reliable way?
4. Were objective, standard criteria used for measurement of the condition?
5. Were confounding factors identified?
6. Were strategies to deal with confounding factors stated?
7. Were the outcomes measured in a valid and reliable way?
8. Was appropriate statistical analysis used?

Tab. 7 – Checklist for Case Control Studies. [96]

ROB question
1. Were the groups comparable other than the presence of disease in cases or the absence of disease in controls?
2. Were cases and controls matched appropriately?
3. Were the same criteria used for identification of cases and controls?
4. Was exposure measured in a standard, valid and reliable way?
5. Was exposure measured in the same way for cases and controls?
6. Were confounding factors identified?
7. Were strategies to deal with confounding factors stated?
8. Were outcomes assessed in a standard, valid and reliable way for cases and controls?
9. Was the exposure period of interest long enough to be meaningful?
10. Was appropriate statistical analysis used?

Tab. 8 - Checklist for Cohort Studies. [96]

ROB question
1. Were the two groups similar and recruited from the same population?
2. Were the exposures measured similarly to assign people to both exposed and unexposed groups?
3. Was the exposure measured in a valid and reliable way?
4. Were confounding factors identified?
5. Were strategies to deal with confounding factors stated?
6. Were the groups/participants free of the outcome at the start of the study (or at the moment of exposure)?
7. Were the outcomes measured in a valid and reliable way?
8. Was the follow up time reported and sufficient to be long enough for outcomes to occur?
9. Was follow up complete, and if not, were the reasons to loss to follow up described and explored?
10. Were strategies to address incomplete follow up utilized?
11. Was appropriate statistical analysis used?

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