Appendix B: Studies examining the relationship between load in sport and risk of injury

Reference	Study design	Sport	Population (n, level, sex, age)	Injury definition	Study duration	Measurements / monitoring	Load monitoring		Load studied					Multiple injury risk factors included	Analysis		Main findings
							External	Internal	Absolute load	Relative load	Competition on calendar congestion	Psychological load	Travel load		Univariate	Multivariate	
Bowen et al., 2016[1]	Prospective cohort	Football	32, elite, male, 17.3 ± 0.9 years (mean ± SD)	Time-loss	2 seasons	Injuries recorded by medical team, load (total distance, high-speed distance, accelerations and total load) captured through GPS/ accelerometer	Y			Y				Y	Y		• Non-contact injury risk was significantly increased when a high acute high-speed distance was combined with low chronic high-speed distance (RR= 2.55), but not high chronic high-speed distance (RR=0.47) • Contact injury risk was greatest when acute:chronic total distance and accelerations ratios were very high (1.76 and 1.77, respectively)(RR=4.98)
Carling et al., 2016[2]	Prospective cohort	Football	1 team, elite, male, n/a	Time-loss	6 seasons	Injuries recorded by medical team, exposure hours, competition congestion (days of recovery between matches), player positional role	Y				Y			Y	Y		• The risk of injury was higher in the final 15 min of the final matches in a two-match congestion cycle (RR: 3.1) and overall (RR: 2.0) and in the first-half (RR: 2.6) of the final game in a three-match congestion cycle • Rates of non-contact injury due to a 'change in direction' (RR: 7.8) and ankle sprains (RR: 10.4) were higher in the third match of a congested cycle
Cross et al., 2016[3]	Prospective cohort	Rugby union	173, elite, male, n/a	Time-loss	1 season	Injuries recorded by medical team, training load (session-RPE; weekly, week-to-week, cumulative 1-4 weeks, training monotony & strain, and acute:chronic load ratio)	Y	Y	Y	Y				Y		Y	• Players had an increased risk of injury if they had high one-week cumulative loads (1245 AU, OR: 1.68), or large week-to-week changes in load (1069 AU, OR: 1.58) • In addition, a 'U-shaped' relationship was observed for four-week cumulative loads, with an apparent increase in risk associated with higher loads (>8651 AU, OR: 1.39)
Duhig et al., 2016[4]	Prospective cohort	Australian football	51, elite, male, 22.2 ± 3.4 years (mean ± SD)	Hamstring strain injury (acute pain in the posterior thigh that caused immediate cessation of exercise)	2 seasons	Injuries recorded by medical team, load (running distances (captured through GPS) and session-RPE)	Y	Y	Y	Y				Y	Y		• Trivial differences were observed between injured and uninjured groups for standardized session-RPE, total distance travelled and distances covered whilst accelerating and decelerating • However, higher than 'typical' (i.e., Z = 0) summed four weekly high-speed running session means were associated with a greater likelihood of hamstring strain injury (OR = 1.96, 95% CI = 1.54 - 2.51, p<0.001) • Furthermore, modelling of high speed running data indicated that reducing mean distances in the week prior to injury may decrease the probability of hamstring strain injury
Ehrmann et al., 2016[5]	Prospective cohort	Football	19, elite, male, 25.7 ± 5.1 years (mean ± SD)	Time-loss (non-contact soft tissue injuries)	1 season	Injuries recorded by medical team, load (total distance, high-intensity running distance, very–high intensity running distance, new body load, and meters per minute) captured through GPS-units	Y			Y				Y	Y		• Players performed significantly higher meters per minute in the weeks preceding an injury compared with their seasonal averages (+9.6 and +7.4% for 1- and 4-week blocks, respectively) (p , 0.01), indicating an increase in training and gameplay intensity leading up to injuries
Hulin et al., 2016[6]	Prospective cohort	Rugby League	28, elite, male, 24.8 ± 3.4 years (mean ± SD)	Time-loss	2 seasons	Injuries recorded by medical team, match and training load (absolute total distance run captured by GPS/micro-technology-units, between-match recovery days)	Y			Y	Y			Y		Y	• No difference was found between the match-injury risk of short and long between-match recovery periods (7.5±2.5% vs 6.8±2.5%) • Players who had shorter recovery and acute:chronic workload ratios ≥1.6, were 3.4–5.8 times likely to sustain a match injury than players with lower acute:chronic workload ratios (RR range 3.41–5.80; CI 1.17 to 19.2) • Acute:chronic workload ratios between 1.2 and 1.6 during short between-match recovery times demonstrated a greater risk of match injury than ratios between 1.0 and 1.2 (RR=2.88; CI 0.97 to 8.55).

Hulin et al., 2016[7]	Prospective cohort	Rugby league	53, elite, male, 23.4 ± 3.5 years (mean ± SD)	Time-loss	2 seasons	Injuries recorded by medical team, load (distance (m) covered in field training and matches captured by GPS/micro-technology-units)	Y			Y				Y	Y		• Compared with all other ratios, a very-high acute:chronic workload ratio (≥2.11) demonstrated the greatest risk of injury in the current week (16.7% injury risk) and subsequent week (11.8% injury risk)
Murray at el., 2016[8]	Prospective cohort	Australian football	46, elite, male, 23.1 ± 3.7 years (mean ± SD)	Time-loss	1 season	Injuries recorded by medical team, load (completed sessions, exposure hours, running loads captured by GPS/micro-technology units)	Y		Y					Y		Y	• No significant difference in injury risk was found between the low training load group (26.8/1,000 hours) and the high training load group (14.2/1,000 hours) ($\chi 2$=3.48, df=2, RR=1.9, p=0.17)
Murray at el., 2016[9]	Prospective cohort	Australian football	59, elite, male, 23 ± 4 years (mean ± SD)	Non-contact time-loss	2 seasons	Injuries recorded by medical team, running load captured by GPS/micro-technology units	Y			Y				Y	Y		• An acute:chronic workload ratio of >2.0 for total distance during the in-season was associated with a 5 to 8-fold greater injury risk in the current (relative risk (RR)=8.65, p=0.001) and subsequent week (RR=5.49, p=0.016) • Players with a high-speed distance acute:chronic workload ratio of >2.0 were 5 to 11 times more likely to sustain an injury in the current (RR=11.62, p=0.006) and subsequent week (RR=5.10, p=0.014)
van der Worp et al., 2016[10]	Prospective cohort	Running	417, female, recreational, 38.6 ± 11.5 (mean ± SD)	Time-loss (running-related pain of the lower back and/or the lower extremity)	12 weeks	Self-reported injuries, questionnaires sent every 4 weeks (from 8 weeks before to 4 weeks after the event), recording personal and anthropometric information, past musculoskeletal injuries, past/current running routines, running-shoe characteristics, and participation in other sports. Two orthopaedic tests (navicular drop test and extension of the first metatarsophalangeal joint) were performed in the 8 weeks period before the event	Y		Y					Y		Y	• A weekly training distance of more than 30 km (HR: 3.28; 95% CI: 1.23- 8.75) and a previous running injury longer than 12 months ago (HR: 1.88; 95% CI: 1.03- 3.45) were associated with the occurrence of running-related injuries
Veugelers et al., 2016[11]	Prospective cohort	Australian football	45, male, elite, 23.4 ± 3.8 years (mean ± SD)	Non-contact time-loss/modified training	15 weeks	Injuries recorded by medical team/fitness staff, training load (session-RPE; one- and two-weekly cumulative; low and high training load groups)	Y	Y	Y					y		Y	• A significant pattern existed across all training load measures which suggested lower odds of injury and illness in high training load groups (p < 0.05, OR = 0.199–0.202)
von Rosen et al., 2016[12]	Prospective cohort	Orienteering	64 (♂: 31, ♀:33), elite, 17 ± 1 years (mean ± SD)	Physical complaint	26 weeks	Weekly web-based questionnaire capturing self-reported data on injuries, training volume, running volume, and running intensity. Injuries diagnosed during telephone interviews.	Y	Y	Y					Y		Y	• Time to the first reported injury was associated with training volume (β = 0.184, p= 0.001), competition time (β = -0.701, p = 0.009), running on asphalt roads (β = -0.348, p = 0.008), and running on forest surfaces and trails (β = -0.331, P = 0.007)
Windt et al., 2016[13]	Prospective cohort	Rugby league	30, elite, male, 25 ± 3 years (mean ± SD)	Match time-loss	1 season	Injuries recorded by medical team, load (completed sessions, exposure hours, running loads captured by GPS-units)	Y			Y				Y		Y	• Controlling for training load in a given week, completing 10 additional preseason sessions was associated with a 17% reduction in the odds of injury in the subsequent week (OR=0.83, 95% CI=0.70 to 0.99) • Increased preseason participation was associated with a lower percentage of games missed due to injury (r=−0.40, p<0.05), with 10 preseason sessions predicting a 5% reduction in the percentage of games missed • Neither acute:chronic workload ratios nor chronic workloads in isolation were significantly associated with injury

Dellal et al., 2015[14]	Prospective cohort	Football	16, elite, male, 24.3 ± 3.2 years (mean ± SD)	Time-loss	3 x 18 days of 6 matches	Injuries recorded by medical team, competition congestion (days of recovery between matches), exposure hours, computerised motion-analysis of running distance and intensity, ball passes and control	Y				Y			Y	Y		• No difference in overall incidence of injury between congested periods and non-congested periods • However, during congested periods, the match injury rate was higher, the training injury rate lower and the mean lay-off duration for injuries was shorter
Fowler et al., 2015[15]	Prospective cohort	Football	18, male, elite, 26.4 (24.7–28.1) years	Time-loss	1 season	Injuries recorded by medical team, exposure hours, travel time and kilometres, training load (session-RPE), wellness questionnaire	Y	Y					Y	Y		Y	• No significant differences existed between match location or competition phase for injury incidence, rate, severity, type, or the activity at the time of injury
Fuller et al., 2015[16]	Prospective cohort	Rugby union	563, male, elite, 22.7/24.0 ± 3.0 years (mean ± SD)	Time-loss	5 years	Injuries recorded by medical team, travel time and time zones, match exposure hours, anthropometry	Y						Y	Y	Y		• There was no evidence to suggest that players were exposed to a greater risk of injury following extensive air travel and crossing multiple time zones
Laux et al., 2015[17]	Prospective cohort	Football	22, elite, male, 25.8 ± 5 years (mean ± SD)	Time-loss	16 months	Injuries recorded by medical team, subjective stress and recovery variables (REST-Q-Sport)		Y				Y		Y		Y	• The stress-related scales “fatigue” (OR 1.70), “disturbed breaks” (OR 1.84) and “injury” (OR 1.77) and the recovery-related scale “sleep quality” (OR 0.53) significantly predicted subsequent injuries
Orchard et al., 2015[18]	Prospective cohort	Cricket	235, elite, male, n/a	Time-loss	15 seasons	Injuries recorded by medical team, match load (number of balls bowled by fast bowlers)	Y		Y	Y				Y		Y	• High acute workload, low recent workload, high previous season workload and moderate career workload are risk factors for tendon injuries in cricket fast bowlers • Low career workload and high recent workload are risk factors for stress fractures in cricket fast bowlers
Orchard et al., 2015[19]	Prospective cohort	Cricket	235, elite, male, n/a	Time-loss	15 seasons	Injuries recorded by medical team, load (fixture congestion)	Y		Y		Y			Y		Y	• Fast bowlers who bowled more than 50 match overs in a 5 day period had a significant increase in injury over the next month compared to bowlers who bowled 50 overs or less (RR 1.54; 95% CI 1.04–2.29) • For periods ranging from 12 to 26 days, there was no statistically-significant increase in injury over the next month from exceeding thresholds of certain amounts of overs, although bowlers who bowled more than 100 overs in 17 days had a non-significant increase in injury over the next month (RR 1.78; 95% CI 0.90–3.50)
Owen et al., 2015[20]	Prospective cohort	Football	23, male, elite, 25.6 ± 4.6 years (mean ± SD)	Time-loss	2 seasons	Injuries recorded by medical team, training load (time spent in high and very high intensity zones of 85-90% and ≥90% of maximal heart rate, exposure hours	Y		Y					Y		Y	• Players achieving more time in the very high intensity zone during training increased the odds of sustaining a match injury (OR=1.87, 95% CI 1.12-3.12, p=0.02), but not training injury
Timpka et al., 2015[21]	Prospective cohort	Athletics	266 (♂: 118, ♀:148), elite, youth and adult athletes	Modified training	12 months	Injuries were self-reported, training load (number of training hours per week, weekly training intensity, training load rank index (the reported training intensity multiplied with minutes of training performed during the week), psychological variables (Body Consciousness Scale, Brief COPE, Perceived Motivational Climate in Sport Questionnaire, Commitment to Exercise Scale)	Y	Y	Y					Y		Y	• The coping behaviour self-blame replaced training load in an integrated explanatory model of overuse injury risk in athletes • What seemed to be more strongly related to the likelihood of overuse injury was not the athletics load per se, but, rather, the load applied in situations when the athlete’s body was in need of rest

Clausen et al., 2014[22]	Prospective cohort	Football	498, female, amateur to elite, 15-18 years of age	Physical complaint	5 months	Self-reported injuries and exposure hours, playing level	Y		Y					Y		Y	• Higher average exposure in injury-free weeks was associated with a lower injury risk (p<0.001) • Players with low exposure (≤1 hour per week) were 3 to 10 times more likely to sustain a time-loss injury compared with other players (p<0.01)
Colby et al., 2014[23]	Prospective cohort	Australian football	46, male, elite, 25.1 ± 3.4 years (mean ± SD)	Medical attention	1 season	Injuries recorded by medical team, game and training load (various measures of running load captured by GPS/accelerometer units)	Y			Y				Y		Y	• Higher cumulative loads predicted increases in injury risk
Hulin et al., 2014[24]	Prospective cohort	Cricket	28, elite, male, 26 ± 5 years (mean ± SD)	Time-loss	5 seasons	Injuries recorded by medical team, training load (balls bowled per week and session-RPE; one-week data (acute load) compared with 4-week rolling average data (chronic load))	Y	Y		Y				Y	Y		• An acute:chronic load ratio >1.5 was associated with an increased risk of injury in the week after exposure, for internal (RR =2.2) and external load (RR=2.1) • Fast bowlers with internal and external acute:chronic load ratios greater than 2 had a relative risk of injury of 4.5 and 3.3, respectively
Huxley et al., 2014[25]	Retrospective cohort	Athletics	103 (♂: 34, ♀: 66, 3 unidentified), 17.7 ± 2.4 years (mean ± SD)	Time-loss (>3 weeks out)	5 years	Self-reported injuries and training load (frequency, intensity, hours and modality)	Y	Y	Y					Y	Y		• Injured athletes trained at a higher intensity at 13-14 years (p<0.01), completed more high-intensity training sessions at 13-14 years (p<0.01) and 15-16 years (p<0.05) and had a higher yearly training load at 13-14 years (p<0.01)
Ivarsson et al., 2014[26]	Prospective cohort	Football	101 (♂: 67, ♀: 34), elite, 16.7 ± 0.9 years (mean ± SD)	Time-loss (>3 days)	10 weeks	Injuries recorded by athletic trainer, psychological load (weekly measurement of levels of daily hassles and daily uplifts) captured through The Hassles and Uplifts Scale		Y				Y		Y		Y	• The results show that injury occurrence was significantly associated with both the initial level of daily hassle and the change in daily hassle • High initial daily hassle levels and a smaller decrease in daily hassles were associated with injury occurrence • Moreover, injury occurrence was significantly associated with a greater decrease in daily uplift
Murray et al., 2014[27]	Prospective cohort	Rugby league	43, elite, male, 24 ± 1 years (mean ± SD)	Time-loss (match)	1 season	Injuries recorded by medical team, competition congestion (days of recovery between matches), match load (activity profiles captured by GPS/micro-technology-units)	Y				Y			Y	Y		• Injury rates for the "adjustables" positional group were the highest after short between-match recovery cycles, whereas the injury rates of hit-up forwards and outside backs positional groups were the highest after long between-match recovery cycles
Nielsen et al., 2014[28]	Prospective cohort	Running	874 (♂: 469, ♀: 464), recreational, 37.2 ± 10.3 years (mean ± SD)	Time-loss (>1 week)	1 year	Self-reported injuries with following clinical examination, running loads captured through GPS-units	Y			Y				Y		Y	• No statistically significant differences in injury rates were found • There was a trend of an increased rate of distance-related injuries (patellofemoral pain, iliotibial band syndrome, medial tibial stress syndrome, gluteus medius injury, greater trochanteric bursitis, injury to the tensor fascia latae, and patellar tendinopathy) in runners who progressed their weekly running distance by more than 30% compared with those progressing less than 10% (hazard ratio = 1.59 [95% CI: 0.96 to 2.66], p = 0.07)
Ristolainen et al., 2014[29]	Retrospective cohort	Cross-country skiing, swimming, long-distance running	446 (♂: 200, ♀: 246), elite, 21.8 ± 4.9 (mean ± SD)	Physical complaint (non-acute causation)	1 year	Self-reported overuse injuries, training load/variables (such as starting age of training, years of active training, hours trained yearly, competition hours and weekly resting days) and anthropometric variables	Y		Y					Y	Y	Y	• Athletes with less than 2 rest days per week during the training season had 5.2-fold risk (95% CI: 1.89-14.06, p=0.001) for an overuse injury • Athletes who trained more than 700 hours during a year had 2.1-fold risk (95% CI: 1.21-3.61, p=0.008) for an overuse injury compared to the others
Schwellnus et al., 2014[30]	Prospective cohort	Rugby union	152, male, elite, 25.0 ± 3.4 years (mean ± SD)	Time-loss	16 weeks	Injuries and related data (on risk factors and mechanisms) recorded by medical team, exposure hours	Y						Y	Y	Y		• There was no difference in the incidence rate of injuries between playing at home compared with away (locations ≥6 h time difference)

Zwingenberger et al., 2014[31]	Prospective cohort	Triathlon	Retrospective: 212 (♂: 169, ♀: 43) , 40.3 years (mean) Prospective: 49, (♂: 40, ♀: 9), 39 years (mean)	n/a	Retrospective: 1 year / Prospective: 1 year	Self-reported injuries, load (weekly training hours, yearly training hours, years of triathlon activity), anthropometric data	Y		Y					Y	Y		• There was no significant difference in the rate of injury between athletes with ≥10 training hours per week (28.7%) and athletes with less than 10 training hours per week (19.5%, p = 0.116).
Bengtsson et al., 2013[32]	Prospective cohort	Football	27 teams, elite, male, n/a	Time-loss	11 seasons	Injuries recorded by medical team, exposure hours, competition congestion (days of recovery between matches)	Y				Y			Y		Y	• Total injury rates (RR 1.09) and muscle injury rates (RR 1.32) were increased in matches with short recovery compared with matches with long recovery before the match • High match load was associated with increased muscle injury rate in matches in the same period, and with increased ligament injury rate in training in the subsequent period
Ivarsson et al., 2013[33]	Prospective cohort	Football	56 (♂: 38, ♀: 18), elite, 25.1 ± 5.5 years (mean ± SD)	Time-loss	1 season	Injuries recorded by medical staff, psychological variables (The Hassle and Uplift Scale, Life Events Survey for Collegiate Athletes, Brief COPE, Swedish Universities Scales of Personality)		Y				Y		Y		Y	• Negative-life-event stress and daily hassle, in addition to trait anxiety, were significant predictors of injury among professional soccer players, accounting for 24% of the variance
Jacobsson et al., 2013[34]	Prospective cohort	Athletics	292 (♂: 131, ♀: 161), elite, adults: 24 years (range 18–37), youth: 17 years	Modified training	1 year	Self-reported injuries, training load (number of training hours per week, weekly training intensity, training load rank index (the reported training intensity multiplied with minutes of training performed during the week)), captured through baseline and weekly questionnaires	Y		Y					Y	Y	Y	• Athletes in the third (HR 1.79; 95% CI 1.54 to 2.78) and fourth training load rank index quartiles (HR 1.79; 95% CI 1.16 to 2.74) had almost a twofold increased risk of injury compared with their peers in the first quartile
Nielsen et al., 2013[35]	Prospective cohort	Running	930 (♂: 468, ♀: 462), recreational, 37.2 ± 10.2 years (mean ± SD)	Time-loss (>1 week)	1 year	Self-reported injuries with following clinical examination, running loads captured through GPS-units. Sex, age, body mass index (BMI), behavior (Type A Self-Rating Inventory), running experience, other sports activity, previous running-related injuries, and other injuries not related to running assessed prior to or at baseline	Y		Y					Y		Y	• No significant or clinically relevant relationships were found for running experience (p=0.30) or other sports activities (p=0.30)
Rasmussen et al., 2013[36]	Retrospective cohort	Running	662 (♂: 468, ♀: 462), recreational, 41.4 ± 10.4 years (mean ± SD)	Time-loss (>2 weeks)	1 year	Self-reported injuries and load (average weekly volume of running) captured through a questionnaire	Y		Y					Y		Y	• When adjusting for previous injury and previous marathons, the relative risk (RR) of suffering an injury rose by 2.02 ([95% CI: 1.26-3.24], p < 0.01) among runners with an average weekly training volume below 30 km/week compared with runners with an average weekly training volume of 30-60 km/week • No significant differences were found between runners exceeding 60 km/week and runners running 30-60 km/week (RR=1.13 [0.5-2.8], p=0.80).
Rogalski et al., 2013[37]	Prospective cohort	Australian football	46, elite, male, 22.2 ± 2.9 years (mean ± SD)	Time-loss/modified training	1 season	Injuries recorded by medical team, training and game load (session-RPE; rolling weekly sums and week-to-week changes in load)	Y	Y		Y				Y	Y		• Larger 1 weekly (>1750 AU, OR= 2.44–3.38), 2 weekly (>4000 AU, OR= 4.74) and previous to current week changes in load (>1250 AU, OR= 2.58) were significantly related (p < 0.05) to a higher injury risk throughout the in-season phase

Visnes et al., 2013[38]	Prospective cohort	Volleyball	141 (♂: 69, ♀: 72), elite, 16.8 ± 0.8 years (mean ± SD)	Symptoms of jumper's knee lasting for at least 12 weeks	4 seasons	Injuries recorded by medical team, match and training load (number of hours of volleyball and other training, number of sets played in matches), body composition	Y		Y					Y		Y	• Volleyball training had an odds ratio of injury (OR: 1.72 (1.18–2.53) for every extra hour trained • Match exposure was the strongest sports-related predictor for developing jumper's knee with an OR of 3.88 (1.80–8.40) for every extra set played per week
Wheeler et al., 2013[39]	Prospective cohort	Water polo	7, female, elite, 23 years (18-29)	Physical complaint (shoulder soreness)	2 training camps	Self-reported shoulder soreness, shooting load (number of shots, time between shots) captured by video cameras	Y		Y					Y		Y	• It was shown that 74% (p=0.013) of shoulder soreness was explained by the volume of goal shooting during training, with greater soreness associated with less rest time between shots (p=0.032)
Carling et al., 2012[40]	Prospective cohort	Football	1 team, elite, male, n/a	Time-loss	26 days	Match injuries recorded by medical team, exposure hours, competition congestion (days of recovery between matches), computerised motion-analysis of running distance and intensity	Y				Y			Y	Y		• The incidence of match injury during the congested fixture period was similar to rates reported outside this period, but the mean lay-off duration of injuries was substantially shorter during the former (p < 0.05)
Gabbett & Ullah, 2012[41]	Prospective cohort	Rugby league	34, elite, male, 23.6 ± 3.8 years (mean ± SD)	Tissue	1 season	Injuries recorded by medical team, training load (high- and low-intensity running and movement activities captured by GPS/micro-technology-units), exposure hours	Y		Y					Y		Y	• The risk of injury was 2.7 (95% CI 1.2–6.5) times higher when very high–velocity running (i.e., sprinting) exceeded 9 m per session • The risk of sustaining a soft-tissue injury was significantly lower in players who covered greater distances at very low, low, and moderate intensities
Sibold & Zizzi, 2012[42]	Prospective cohort	American football, football, volleyball, tennis, cross-country running	177 (♂: 116, ♀: 61), collegiate athletes, 19.5 ± 1.4 years (mean ± SD)	Time-loss	n/a	Injuries recorded by athletic trainers, psychological variables (Life Events Survey for College Athletes, Sport Anxiety Scale), orthopaedic screening		Y				Y		Y		Y	• Higher levels of negative life-event stress (z=5.02, p< 0.001), as well as worry (z=2.98, p<0.003) predicted a lower injury risk, whereas concentration disruption (z=-3.95, p<0.001) predicted higher injury risk
Fleisig et al., 2011[43]	Retrospective cohort	Baseball	481, youth pitchers, male, 12.0 ± 1.7 years (mean ± SD)	Elbow surgery, shoulder surgery, or retirement due to throwing injury	10 seasons	Self-reported injuries, pitching load (amount of pitching, curveballs thrown) captured through annual questionnaire	Y		Y					Y	Y		• Participants who pitched more than 100 innings in a year were 3.5 times more likely to be injured (95% CI: 1.16 to 10.44)
Gabbett & Jenkins, 2011[44]	Prospective cohort	Rugby league	79, elite, male, 23.3 ± 3.8 years (mean ± SD)	Physical complaint	4 seasons	Injuries recorded by medical team, training load (session-RPE), exposure hours	Y	Y	Y					Y	Y		• Training load was significantly related (P < 0.05) to overall injury (r = 0.82), non-contact field injury (r = 0.82), and contact field injury (r = 0.80) rates, suggesting that the harder professional rugby league players train, the more injuries they are likely to sustain
Johnson & Ivarsson, 2011[45]	Prospective cohort	Football	108 (♂: 85, ♀: 23), high-school, 17-19 years	n/a	1 season	Injuries recorded by athletic trainers, psychological variables (Life Events Survey For Collegiate Athletes, State Trait Anxiety Inventory, Sport Anxiety Scale, Athletic Coping Skills Inventory-28, Swedish Universities Scales of Personality)		Y				Y		Y		Y	• Negative life event stress significantly predicted the occurrence of injury • In total, four significant predictors could together explain 23% of injury occurrence: life event stress, somatic trait anxiety, mistrust and ineffective coping

Saw et al., 2011[46]	Prospective cohort	Cricket	28, elite, male, 24.4 ± 3.9 years (mean ± SD)	Physical complaint (shoulder or elbow pain associated with throwing)	1season	Injuries recorded by medical team, throwing load (number of throw-downs, fielding drill throws, warm-up throws, match throws) captured through video recordings or recorded by researchers/reported by players	Y		Y					Y	Y		• Injured players threw approximately 40 more throws/week (p=0.004) and 12.5 more throws per throwing day (p=0.061) than uninjured players • Players were at a significantly increased risk of injury if they completed more than 75 throws/week (RR: 1.73, 95% CI: 1.03 to 2.92), and there was a trend towards an increased risk if they completed more than 40 throws per throwing day (RR: 1.41, 95% CI: 0.88 to 2.26) • Injured players also completed more throws and had more throwing days (and consequently less rest days) in the week before injury, as compared with the rest of their season preceding that point
Brink et al., 2010[47]	Prospective cohort	Football	53, elite, male, 15-18 years	Physical complaint	2 seasons	Injuries recorded by medical team, match and training load (session-RPE, exposure hours; training monotony/strain); REST-Q-Sport	Y	Y	Y			Y		Y		Y	• Physical load (duration, load monotony, strain) was positively associated with traumatic injury (range OR 1.01 to 2.59) • The association between psychosocial load and injury risk was unclear, with only 1 (“fitness/injury”) out of 19 subscales being significantly higher for players with injury
Carling et al., 2010[48]	Prospective cohort	Football	32, elite, male, n/a	Time-loss	4 seasons	Injuries recorded by medical team, exposure hours, competition congestion (days of recovery between matches), player positional role	Y				Y			Y	Y		• A very short interval (≤ 3 days) between fixtures did not result in a greater injury rate (p = 0.40) or number of days lost to injury (p = 0.73) compared to a longer interval (≥ 4 days)
Dupont et al., 2010[49]	Prospective cohort	Football	1 team, elite, male, 25.6 ± 3.8 years (mean ± SD)	Time-loss	2 seasons	Injuries recorded by medical team, exposure hours, match-related physical performance (total distance, high-intensity distance, sprint distance, and number of sprints)	Y				Y			Y	Y		• The injury rate was significantly higher when players played 2 matches per week versus 1 match per week (25.6 versus 4.1 injuries per 1000 hours of exposure; p<.001)
Gabbett, 2010[50]	Prospective cohort	Rugby league	91, elite, male, 23.7 ± 3.8 years (mean ± SD)	Time-loss	4 seasons	Injuries recorded by medical team, training load (session-RPE), exposure hours	Y	Y	Y					Y	Y		• Players were 50–80% likely to sustain a preseason injury within the training load range of 3,000–5,000 units. These training load thresholds were considerably reduced (1,700–3,000 units) in the late-competition phase of the season • Players that exceeded the training load threshold were 70 times more likely to test positive for noncontact, soft-tissue injury in an injury prediction model
Ivarsson & Johnson, 2010[51]	Prospective cohort	Football	48, amateur, male, 16-36 years	Time-loss	4 months	Injuries recorded by athletic trainers, psychological variables (Daily Hassles Scale, Life Events Survey for Collegiate Athletes, Football Worry Scale, Swedish universities Scales of Personality, Brief COPE)		Y				Y		Y		Y	• No significant relationships between negative life event stress or levels of daily hassles and injury, although a tendency was identified for the latter • Injury was significantly predicted by 4 personality trait predictors: somatic trait anxiety, psychic trait anxiety, stress susceptibility, and trait irritability
Killen et al., 2010[52]	Prospective cohort	Rugby league	36, elite, male,	Physical complaint	14 weeks (preseason)	Injuries recorded by medical team, training load (session-RPE; training monotony, training strain), psychological variables (players’ perceptions relating to sleep, food, energy, mood, and stress), exposure hours	Y	Y	Y			Y		Y	Y		• No significant relationship was found between the preseason weekly injury rate and the weekly load, nor was there a relationship between injury and psychological data

Main et al., 2010[53]	Prospective cohort	Triathlon	30 (♂: 20, 27.1 ± 9.1 years, ♀: 10, 27.4±6.6 years) (mean ± SD), well-trained	n/a	45 weeks	Weekly self-reported signs and symptoms of injuries (and minor aches and pains), upper-respiratory tract infections (e.g. headaches, nasal congestion, sneezing, sore throat, coughing etc.), load (number of training sessions per week, training duration, five point scale for perception of the session intensity, psychological variables (Perceived Stress Scale, Brunel Mood Disturbance Scale, Training Stress Scale, Athlete Burnout Questionnaire)	Y	Y	Y			Y		Y		Y	• Signs and symptoms of injury and illness (SAS) were significantly associated with increases in load ($p \leq 0.05$) • The greatest impact on SAS was produced by psychological stressors ($P \leq 0.001$)
Sein et al., 2010[54]	Cross-sectional	Swimming	80 (♂: 42, ♀: 38), elite, 15.9 ± 2.7 (mean ± SD)	Physical complaint (shoulder pain) / supraspinatus tendinopathy		Self-reported shoulder pain, clinically measured glenohumeral joint laxity, magnetic resonance imaging of the shoulder, training load (number of years, hours per week, weekly swimming distance, percentage of time in training spent in each stroke over the previous 3 months) captured through a questionnaire	Y		Y					Y		Y	• The number of hours swum/week (r_s=0.39, p<0.005) and weekly mileage (r_s=0.34, p=0.01) both correlated significantly with supraspinatus tendinopathy, while swimming stroke preference did not
Vleck et al., 2010[55]	Retrospective cohort	Triathlon	35, elite, male, n/a	Physical complaint	5 years	Self-reported (questionnaire) data on injury, training load (number, duration & type of training sessions), equipment type, demographic information, competitive experience (years), highest competitive level, personal best times, warm-up/cool-down & stretching practices	Y		Y					Y	Y		• Overall, running injury occurrence pos. correlated with total run training time (r=0.34, p<0.05), Achilles tendon injury occurrence pos. correlated with distance covered doing "run hill reps" (r=0.92, p<0.01) and slightly neg. correlated with time spent doing "long runs" (r=0.15, p<0.05), lower back injury occurrence pos. correlated with "speed bike" training time (r=0.52, p<0.01) • In Olympic distance triathletes, overuse injury was linked with percentage of training time spent performing "bike hill reps" (r=0.44, p<0.05) and frequency of both "hill rep" bike sessions (r=0.39, p<0.05) and "other" bike sessions (r=0.35, p<0.05) • In Ironman distance triathletes, overuse injury was pos. correlated with both the duration of each "speed run" session (r=0.56, p<0.05) and "speed bike" training time (r=0.67, p<0.01), and running overuse injuries was linked to competitive running experience (r=0.59, p<0.05)
Jayanthi et al., 2009[56]	Cross-sectional	Tennis	n/a, elite, boys and girls; age division 12, 14, 16, 18 years	Medical withdrawal	64 tournaments	Medical withdrawals recorded as injuries, load (number of matches) captured through official website	Y				Y			Y		Y	• The medical withdrawal rate was significantly higher in the fifth match or greater (26.3/1000) versus the first 4 matches (12.7/1000; P < 0.0001), even when analysing main draw and singles matches
Orchard et al., 2009[57]	Prospective cohort	Cricket	129, elite, male, n/a	Time-loss	10 seasons	Injuries recorded by medical team, load (number of overs)	Y		Y					Y	Y		• Bowlers who bowled more than 50 overs in a match had an injury incidence in the next 21 days of 3.37 injuries per 1000 overs bowled, a significantly increased risk compared with those bowlers who bowled less than 50 overs (RR: 1.77, 95% CI: 1.05-2.98) • Bowlers who bowled more than 30 overs in the second inning of a match had a significantly increased injury risk per over bowled in the next 28 days (RR: 2.42, 95% CI: 1.38-4.26)

Piggott et al., 2009[58]	Prospective cohort	Australian football	16, elite, male, 23.8 ± 5.1 years (mean ± SD)	Time-loss	15-week pre-season	Injuries (and illnesses) recorded by medical team, training load (session-RPE, mins > 80% max HR, total distance run, total distance run > 12 km/h (GPS-units), spikes (>10% change in load)), training load strain and monotony	Y	Y	Y	Y				Y	Y		• There was a significant relationship between total distance run and incidence of injury (r = -0.52, p = 0.048) • It was found that 40% of injuries could be explained by a preceding spike in training load
Steffen et al., 2009[59]	Prospective cohort	Football	1430, youth, female, 15.4 ± 0.8 years (mean ± SD)	Time-loss	1 season	Injuries recorded by physical therapists, psychological variables (Life Event Scale for Collegiate Athletes, Norwegian Sports Anxiety Scale, Brief Cope, Perception of Success Questionnaire, Perceived Motivational Climate in Sport Questionnaire) and data on sports participation, injury history and present lower limb symptoms and function captured through pre-season questionnaire		Y				Y		Y	Y	Y	• High life stress (P=0.001) and perception of a mastery climate (P=0.03) were significant risk factors for new injuries • In addition, there were significant differences in disfavour for previously injured compared with non-injured players for ego orientation (p=0.007), perception of a performance climate (p=0.003) and experienced stressful life events (P<0.001)
Viljoen et al., 2009[60]	Prospective cohort	Rugby union	38, elite, male, 26 ± 2 years (mean ± SD)	Medical attention	3 seasons	Injuries recorded by medical team, training load (hours of off-season, pre-season, in-season and total training) recorded by strength and conditioning coach	Y		Y					Y	Y		• There was a non-significant association between reduction in training volume and reductions in the in-season match (p=0.06) and in-season total (p=0.09) injury rates over the 3 years • However, total preseason injury rates and the number of recurrent injuries show an opposite non-significant trend
Brooks et al., 2008[61]	Prospective cohort	Rugby union	502, elite, male, n/a	Time-loss	2 seasons	Injuries recorded by medical team, training load (match and training exposure hours) recorded by team fitness coaches	Y		Y					Y	Y		• Higher training volumes (49.1 hours per week) did not increase the incidence of match or training injuries. However, higher training volumes did increase the severity of match injuries, particularly during the second half, and consequently resulted in a significant increase in the number of days' absence due to match injuries
Knobloch et al., 2008[62]	Retrospective cohort	Running	291 (♂: 248, ♀: 41), elite, 42 ± 9 years (mean ± SD)	Physical complaint	8 months	Self-reported injuries, load (years of running experience, number of training kilometres per week, kilometres per year, number of running contests within the last season, participation in other sports), and other variables (sex, age, BMI, preferred running discipline, competition level, running surfaces, use of eccentric training for the Achilles tendon, use of protective equipment, and time using each pair of shoes) captured through questionnaire	Y		Y					Y	Y		• Running more than 4 times a week (RR: 2.3, CI: 1.09 to 4.96, p = 0.025) or for more than 2600 km exposure (RR: 2, CI: 1.11 to 3.48, p = 0.02) had a higher risk for shin splint overuse injuries • Training more than 65 km/week increased the risk for back overuse injuries (RR: 2.3, CI: 1.13 to 4.65, p = 0.019) • Runners with more than 10 years of experience had a higher risk for overuse injuries of the back (RR: 3.3, CI: 1.16 to 4.57, p = 0.015) and Achilles tendinopathy (RR: 1.6, CI: 1.02 to 2.76, p = 0.041)
Van Middelkoop et al., 2008[63]	Prospective cohort	Running	694, recreational, male, 44 ± 9.6 years (mean ± SD)	Time-loss	1 month	Self-reported injuries, load (training distance, frequency and duration, running experience, type of training underground, training type (long-distance, interval) and shoes), and other variables (demographic factors, race event factors, lifestyle factors) captured through baseline and post-marathon questionnaires	Y		Y					Y	Y	Y	• More than six races in the previous 12 months [OR: 1.66; CI: 1.08–2.56] was associated with the occurrence of lower extremity injuries • Training distance >40 km a week was found to be a strong predictor of future calf injuries

Gabbett & Domrow, 2007[64]	Prospective cohort	Rugby league	183, elite, male, 21.4 years (mean)	Time-loss	2 seasons	Injuries recorded by medical team, training load (session-RPE), exposure hours, anthropometry, multi-stage fitness test, vertical jump test, agility test	Y	Y	Y	Y				Y	Y		• There was a 1.50 – 2.85 increase in the odds of injury for each arbitrary unit increase in training load • During the pre-season training phase there was a relationship between the 155-590 arbitrary unit training load range and injury incidence
Kelsey et al., 2007[65]	Prospective cohort	Running	127, competitive, female, 18–26 years	Stress fractures (confirmed by x-ray, bone scan, or MRI)	1.85 year per woman	Self-reported stress fractures confirmed by imaging, load (running experience, number of miles per week), bone densitometry, age at menarche and the number of menses per year	Y		Y					Y		Y	• There was no association between training load and risk of stress fracture
Lovell et al., 2006[66]	Retrospective cohort	Football	19, elite, male, 15-17 years	Osteitis pubis (physical complaint, clinical diagnose, MRI)	4 months	Retrospective recording of 2 months training load (questionnaire); prospective review of clinical diagnosis, investigations and records on presentation of athletes with groin pain; prospective serial MRI examinations of the pubis symphysis with grading of bone marrow oedema and other abnormalities	Y			Y				Y	Y		• There was a greatly decreased risk of developing groin pain (osteitis pubis) with more training prior to entry of the AIS soccer program (OR per 4 sessions of training, 0.003)
McKean et al., 2006[67]	Retrospective cohort	Running	2886, recreational, male & female, n/a	Time-loss	1 year	Self-reported injuries (diagnosed by health professional or themselves), load (number of runs and miles per week, years of running experience) and other variables (shoe characteristics, orthotic use) captured through questionnaire	Y		Y					Y		Y	• Running more times per week increased the risk of injury for both older and younger runners (OR: 1.32 – 2.24)
Olsen et al., 2006[68]	Case-control	Baseball	140, male, 14-20 years	Shoulder or elbow surgery / shoulder or elbow pain (controls)	1 year	Injuries recorded by orthopaedic surgeons. Self-reported injury history, load (numerous variables related to playing history), and other potential risk factors captured through questionnaire	Y		Y					Y		Y	• The injured group pitched significantly more months per year, games per year, innings per game, pitches per game, pitches per year, and warm-up pitches before a game • These pitchers were more frequently starting pitchers, pitched in more showcases, pitched with higher velocity, and pitched more often with arm pain and fatigue
Rauh et al., 2006[69]	Prospective cohort	Cross-country running	421 (♂: 235, ♀: 186), high-school, n/a	Time-loss	1 season	Injuries recorded by coaches, daily training load and exposure recorded by coaches (distance, intensity, surface, terrain), baseline questionnaire (prior running and injury experience), anthropometric measurements	Y		Y					Y		Y	• No significantly increased injury risks were found in relation to overall mileage or mileage by running pace
Schueller-Weidekamm et al., 2006[70]	Cross-sectional	Running	26 (♂: 7, ♀: 19), non-professional, 33 ± 5 years (mean ± SD)	Chronic knee lesions	n/a	Injuries recorded by radiologist and MRI specialist through MRI, load (training distance per week, running frequency, average duration of training per year, and training pace) captured through questionnaire	Y		Y					Y	Y		• Runners with a higher training level showed a statistically significant higher score for all chronic knee lesions than those with a lower training level ($p < 0.05$)
Dennis et al., 2005[71]	Prospective cohort	Cricket	44, junior, male, 14.7 ± 1.4 years (mean ± SD)	Physical complaint leading to time-loss/reduced performance (bowling overuse)	1 season	Injuries recorded by medical team, self-reported load (number of match and training deliveries bowled each day)	Y		Y		Y			Y	Y		• Injured bowlers had been bowling significantly more frequently than uninjured bowlers ($p = 0.038$) • Compared with bowlers with an average of >3.5 rest days between bowling, bowlers with an average of <3.5 rest days were at a significantly increased risk of injury (RR=3.1, 95% CI: 1.1 to 8.9)

Rogers & Landers, 2005[72]	Prospective cohort	Football	171 (♂: 98, ♀: 73), 16.1 ± 1.0 years (mean ± SD)	Time-loss	1 season	Injuries recorded by athletic trainer, psychological variables (Life Events Survey for Athletes, Perceived Stress Scale, State-Trait Anxiety Inventory, Perceived Social Support Friends/Family scales, Athletic Coping Skills Inventory), peripheral vision		Y				Y		Y	Y		• Results showed that total life-event stress, negative life-event stress, and psychological coping skills significantly contributed to the prediction of the occurrence of athletic injury • Additionally, psychological coping skills buffered the negative life-event stress/athletic injury relationship • Peripheral narrowing during stress significantly mediated 8.1% of the negative life event stress/athletic injury relationship
Gabbett, 2004[73]	Prospective cohort	Rugby league	220, sub-elite, male, n/a	Physical complaint	3 seasons	Injuries recorded by head trainer, load (session-RPE), pre-season fitness tests, environmental conditions	Y	Y	Y					Y	Y	Y	• High pre-season training loads were associated with higher training injury rates
Gabbett, 2004[74]	Prospective cohort	Rugby league	79, semi-professional, male, n/a	Physical complaint	1 season	Injuries recorded by head trainer, match and training load (session-RPE)	Y	Y	Y					Y	Y		• A significant relationship (p<0.05) was observed between training injury incidence and training intensity (r= 0.83), training duration (r= 0.79) and training load (r =0.86) • In addition, the incidence of match injuries were significantly correlated (p<0.05) with match intensity (r= 0.74), match duration (r = 0.86) and match load (r =0.86)
Shaw et al., 2004[75]	Cross-sectional	Triathlon	258 (♂: 190, ♀: 68), competitive & recreational, 16 - 63 years (mean=35 years)	Time-loss / medical attention / adverse social or economic effects / modified training	n/a	Self-reported injuries and load (total hours trained, number of hours trained weekly in the different disciplines) through questionnaire	Y		Y					Y		Y	• Associations between hours of training and sustaining an injury were U-shaped, with those triathletes training at low levels and at high levels more likely to sustain an injury • The likelihood of sustaining an injury was least when training for a total of 8 to 10 hours per week, specifically cycling for five to six hours and running for three to four hours weekly
Anderson et al., 2003[76]	Prospective cohort	Basketball	12, NCAA Division III, female, 18-22 years	Medical attention / time-loss	1 season	Weekly self-reported injuries, illnesses, and load (session-RPE, training monotony, training strain)	Y	Y		Y				Y	Y		• An increase in injuries occurred during times of increased training loads, particularly during the first 2 weeks of formal practice, and immediately subsequent to the holidays • The temporal relationship between training load and injury suggests a causative link (p < 0.01; r = 0.675)
Burns et al., 2003[77]	Prospective cohort	Triathlon	131 (♂: 91, ♀: 40), national level, 33.7 years (18-65)	Time-loss / medical attention / modified training / taking medicine	10 weeks (with 6-month retrospective survey)	Self-reported injuries, load (triathlon experience, training hours in swimming, cycling, and running), demographic data, warming-up and cooling-down protocol	Y		Y					Y		Y	• Years of triathlon experience was associated with a significant increase in risk of injury ($\chi2$ = 7.387, p = 0.007, odds ratio = 1.66) • For competition season injury, there was an increase in risk in those triathletes who had higher preseason running mileage: for every extra hour per week of preseason running there was a 12% increased risk of competition season injury ($\chi2$ = 7.961, p = 0.005, OR = 1.12)
Dennis et al., 2003[78]	Prospective cohort	Cricket	90, elite, male, 27 years (18 - 38)	Time-loss / performance-limiting / surgery	2 seasons	Injuries recorded by medical team, load (the frequency of bowling, the type of bowling performed (match or training) and the time frame within which the bowling was completed) captured by observation and fixture scorecards	Y		Y		Y			Y		Y	• Compared to those bowlers with an average of 123-188 deliveries per week, bowlers with an average of fewer than 123 deliveries per week (RR= 1.4, 95% CI 1.0 to 2.0) or more than 188 deliveries per week (RR= 1.4, 95% CI 0.9 to 1.6) may be at an increased risk of injury • Compared to bowlers with an average of 3-3.99 days between bowling sessions, bowlers with an average of less than 2 days (RR = 2.4, 95% CI 1.6 to 3.5) or 5 or more days between sessions (RR= 1.8, 95% CI 1.1 to 2.9) were at a significantly increased risk of injury
Egermann et al., 2003[79]	Retrospective cohort	Triathlon	656 (♂:588, ♀: 68), sub-elite, 35.8 ± 7.8 years (mean ± SD)	Time-loss	n/a	Self-reported injuries, load (number of years in competitive triathlon, weekly training hours in swimming, cycling, and running), demographic data	Y		Y					Y		Y	• Athletes with more than 20 training hours per week had significantly more chronic back pain (p = 0.002)) • Athletes with a large number of weekly training hours suffered more muscle-tendon injuries (p = 0.014) (univariate only)

Taunton et al., 2003[80]	Prospective cohort	Running	844 (♂: 205, ♀: 635), recreational, n/a	Physical complaint	13 weeks	Self-reported (questionnaire administered 3 times over 13 weeks) injuries, load (days of running per week), demographic data, body mass index, predominant running surface, arch height, running shoe age, and concurrent cross training	Y		Y					Y		Y	• Running only one day a week was a significant risk factor in women, whereas in men, only a non-significant trend was found.
Hootman et al., 2002[81]	Prospective cohort	Running	3090 (♂: 2481, ♀: 609), recreational, 20-85 years	Medical attention	5 years	Self-reported injuries, load (number of miles per session, times per week, and pace per mile), demographic and anthropometric data captured through 12-month and five-year recall periods	Y		Y					Y		Y	• Running, walking or jogging mileage >20 miles per week, together with older age and previous lower extremity injury predicted lower extremity injury for both men and women.
Lyman et al., 2002[82]	Prospective cohort	Baseball	476 (♂: 475, ♀: 1), youth, 12 years (9-14)	Physical complaint (elbow or shoulder pain)	1 season	Self-reported injuries (questionnaires and interviews), load (types of pitches thrown, pitch counts, and pitching mechanics) captured through questionnaires, pitch count book, and video analysis, respectively	Y		Y					Y		Y	• There was a significant association between the number of pitches thrown in a game and during the season and the rate of elbow pain and shoulder pain
Lee et al., 2001[83]	Prospective cohort	Rugby union	803, professional / amateur, 23.9 ± 6.65 years (mean ± SD)	Time-loss	1 season	Injuries recorded by "observers", self-reported load (number of weeks and sessions of attendance, average number of sessions per week, weekly hours of aerobic and power activities)	Y		Y					Y		Y	• There was a 3.9% relative increase (95% CI 1.9 to 5.9%) in the risk of injury over the season for each additional preseason training week attended
Lyman et al., 2001[84]	Prospective cohort	Baseball	298, youth, male, 10.8 ± 1.2 years (mean ± SD)	Physical complaint (elbow or shoulder pain)	2 seasons	Injuries, load (seasons pitched, pitching practice frequency, pitch count, pitch types used), baseball participation (e.g., years played, primary position played, baseball camp attendance), and demographic characteristics captured through interviews and pitch count books	Y		Y					Y		Y	• Throwing fewer than 300 or more than 600 pitches during the season was a risk factor for elbow pain • Throwing more than 75 pitches in a game, and throwing fewer than 300 pitches during the season were risk factors for shoulder pain
Duffey et al., 2000[85]	Retrospective cohort	Running	169, recreational, 35/36 ± 1 year (mean ± SD)	Time-loss / modified training / medical attention (anterior knee pain)	1 year	Injuries recorded by medical personnel, load (training regimen, running terrain, running experience) captured through questionnaire. In addition, anthropometric, muscular strength and endurance, rear-foot movement and kinetic data were collected.	Y		Y					Y		Y	• There was no difference in average weekly mileage or training pace between injured and uninjured runners
Fawkner et al., 1999[86]	Prospective cohort	Field hockey, volleyball, triathlon	98 (♂:29, ♀: 69), elite / recreational, 26.1 ± 4.2 years (mean ± SD)	Time-loss / medical attention	13 / 18 weeks	Injuries and load (daily hassles scale) self-reported / recorded by coaches		Y				Y		Y	Y		• Injured athletes were found to have a significant increase in minor life events (daily hassles) in the week prior to injury

McCrory et al., 1999[87]	Retrospective cohort	Running	89, recreational / competitive, n/a	Achilles tendinitis (inflammation and irritation of the Achilles tendon)	1 year	Injuries recorded by medical personnel, load (training pace, weekly mileage, years running,) captured through questionnaire. In addition, anthropometric, isokinetic, rear-foot movement and kinetic data were collected.	Y		Y					Y		Y	• Years running and training pace were significant risk factors for Achilles tendinitis
Satterthwaite et al., 1999[88]	Prospective cohort	Running	875, recreational, n/a	Medical attention / physical complaint	1 week	Injuries, load (running experience, training pattern), and demographic data captured through medical service, interviews and questionnaire	Y		Y					Y		Y	• Increased training was associated with increased risk of front thigh and hamstring problems, but decreased the risk of knee problems
Vleck & Garbutt, 1998[89]	Retrospective cohort	Triathlon	194, elite / competitive, n/a	Time-loss / modified training / taking medicine / medical attention	5 years	Self-reported injuries, load (training mileage, training time, and number of workouts in swimming, cycling and running over one week, years of competitive experience), anthropometric data and other risk factor data captured through questionnaire	Y		Y					Y	Y		• The number of running injuries sustained correlated with triathlon training distance, cycling distance ($p < 0.03$), swimming distance ($p < 0.01$), number of triathlon workouts ($p < 0.03$) and number of running sessions ($p < 0.03$) within one weeks race training • The number of overuse injuries sustained during cycling correlated with time spent running and cycling
Bennell & Crossley, 1996[90]	Retrospective cohort	Athletics	95 (♂: 49, ♀: 46), elite / competitive, 20.3 ± 2.0 (mean ± SD)	Modified training >1 week	1 year	Injuries, load (average number of weekly training hours, training type, running distance), anthropometric, menstrual and biomechanical risk factors captured through interview	Y		Y					Y	Y		• There was no significant difference in average weekly training hours, running distance or training type when comparing injured and uninjured athletes
Koplan et al., 1995[91]	Retrospective cohort	Running	535 (♂: 326, ♀: 209), recreational,	Modified training / interference with school or work	10 years	Self-reported injuries and load (running mileage) captured through questionnaire	Y		Y					Y	Y		• The probability of experiencing an injury was associated with higher weekly mileage
Messier et al., 1995[92]	Retrospective cohort	Running	126, male & female, recreational / competitive, n/a,	Time-loss / modified training / medical attention (iliotibial band friction syndrome)	n/a	Injuries recorded by medical personnel, load (training regimen, running experience) captured through questionnaire, anthropometric, rear-foot motion, ground reaction force, knee muscular strength and endurance data were collected	Y		Y					Y		Y	• Weekly mileage, training pace, number of months using current training protocol, percentage of time spent swimming, and percentage of time spent running on a track were significant risk factors for injury
D'Souza, 1994[93]	Retrospective cohort	Athletics	147 (♂: 96, ♀: 51), university and junior athletes, 18 ± 2.5 years (mean ± SD)	Time loss (>1 week)	1 year	Questionnaire (once) Injury frequency, severity and types; hours of training, number of training sessions attended, event specialisation, level of competition	Y		Y					Y	Y		• No significant relationship was found between the incidence of injuries and the hours spent in training
Korkia et al., 1994[94]	Prospective cohort	Triathlon	155 (♂: 124, ♀: 31), recreational, intermediate or elite, 34 ± 8.9 years (♂), 32 ± 7.3 (♀) years (mean ± SD)	Time-loss	8 weeks	Self-reported injuries, training load (type of activity, intensity, mileage, duration, surface and rest days)	Y		Y					Y	Y		• The likelihood of an injury was positively associated with experience in triathlon, but not with the mean amount of weekly training or competition, intensity or frequency of training

Haglund-Åkerlind & Eriksson, 1993[95]	Retrospective cohort	Running	83, competitive, 26.9 ± 5.7 years (injured) 24.0 ± 6.5 years (uninjured) (mean ± SD)	Physical complaint (Achilles tendon problems)	n/a	Self-reported injuries, load (number of years in training; training sessions per week; distance covered per week; interval distance per week; hill, strength and jump training sessions per week; and number of competitive events per year), demographic & anthropometric data, data on running results, use of stretching, surface, and running shoes captured through questionnaire. Measurement of range of motion of the ankle and hip joints using a manual goniometer, assessment of malalignment and muscle atrophy and examination of the Achilles tendon were done in 20 runners.	Y		Y					Y	Y		• The runners with Achilles tendon problems had trained for significantly more years and covered significantly longer distances per week than runners without Achilles tendon problems
Bovens et al., 1989[96]	Prospective cohort	Running	73 (♂: 58, ♀: 15), recreational, ♂: 35.2 ± 7.9 years, ♀: 33.5 ± 6.4 years (mean ± SD)	Physical complaint resulting in modified training	18—20 months	Self-reported injuries and load (distance, frequency, intensity of running) captured through a diary	Y		Y					Y	Y		• There was a significant correlation between injuries and the distance covered during the training at the start of the training program
Collins et al., 1989[97]	Retrospective cohort	Triathlon	257 (♂: 197, ♀: 60), recreational / elite, 32 years (mean)	Time-loss / modified training / taking medicine / medical attention	1 year	Self-reported injuries, load (mileage per week and number of years in swimming, cycling, and running; hill training; number of previous triathlons; use of weights; participation in other sports), demographic data captured through questionnaire	Y		Y					Y	Y		• Elite triathletes averaged more miles per week in each sport than the athletes as a whole and showed a higher incidence of injury (60%), although this was not a significant difference • Higher weekly swimming, cycling, and running mileages did not lead to a higher incidence of injury
Macera et al., 1989[98]	Prospective cohort	Running	583 (♂: 485, ♀: 98), habitual runners, ♂: 41.6 ± 9.5 years, ♀: 36.1 ± 8.2 years (mean ± SD)	Modified training / medical attention / medication use (lower extremity)	Retrospective: 1 year / Prospective: 1 year	Self-reported injuries, load (average weekly distance, average days of running per week, participation in other physical activities), and demographic characteristics captured through baseline and monthly questionnaires	Y		Y					Y		Y	• Running 64 km (40 miles) or more per week was the most important predictor of injury for men during the follow-up period (OR=2.9) • Risk also was associated with having been a runner for less than 3 years (OR=2.2)
Marti et al., 1989[99]	Retrospective cohort	Running / bobsleigh	27 (running, mean age 42), 9 (bobsleigh, mean age 42), 23 controls (mean age 35)	Radiological evidence of degenerative hip disease	15 years	Load (weekly mileage), physiological and exercise characteristics of all subjects had been recorded in 1973, and in 1988 these measurements were repeated together with radiological examination of the hips	Y		Y					Y		Y	• Mileage run (p=0024) (and age, p=0-017) in 1973 emerged as independent, significant, and positive predictors of radiological signs of degenerative hip disease in 1988 • Among runners alone running pace in 1973 rather than mileage run was the stronger predictor of subsequent degenerative hip disease

Walter et al., 1989[100]	Prospective cohort	Running	1288 (♂: 985, ♀: 303), recreational / competitive, n/a	Modified training / medication use / medical attention	Retrospective: 1 year / Prospective: 1 year	Self-reported injuries, load (mileage, intensity, pace, years of running experience); running environment; use of stretching, warm-up, and cool-down exercises; activity in other sports or exercise; occupational activity level; characteristics of shoes; height and weight; racing history; smoking status captured through questionnaires.	Y		Y					Y		Y	• The risk of injury was associated with increased running mileage, but not with other aspects of training, such as usual pace, usual running surface, hill running, or intense training
Marti et al., 1988[101]	Retrospective cohort	Running	4358, recreational, male, 35.0 ± 10.0 years (uninjured runners), 34.8 ± 10.1 years (injured runners) (mean ± SD)	Physical complaint	1 year	Self-reported injuries, load (number of kilometres run per week, years of running), data on running shoes, surface, use of orthotic devices, anthropometrics, medical consultations, work absences, and motivation captured through questionnaire	Y		Y					Y	Y		• Occurrence of running injuries was independently associated with higher weekly mileage ($p < 0.001$) • Higher mileage was also associated with more frequent medical consultations due entirely to running-related injuries
Lysholm & Wiklander, 1987[102]	Prospective cohort	Running	60 (♂: 44, ♀: 16), competitive / elite, n/a	Modified training >1 week	1 year	Self-reported injuries, load (mileage per month, number of workouts per month) captured through monthly questionnaires	Y		Y					Y	Y		• In marathon runners there was a significant correlation between the injury rate during any 1 month and the distance covered during the preceding month ($r = 0.59$) • No significant relation emerged between distance run and injury days during the same month
Jacobs & Berson, 1986[103]	Retrospective cohort	Running	451 (♂:355, ♀: 96), ♂: 33.9 (14-64) years, and ♀: 32.4 (8-57) years	Physical complaint	2 years	Self-reported injuries, load (miles run per week, days run per week, average pace of workouts, length of time running regularly, as well as interval, sprint, or hill running) and demographic information captured through questionnaire	Y		Y					Y	Y		• Injured runners differed significantly from non-injured runners in that they were more likely to have (1) run more miles per week, (2) run more days per week, (3) run a faster pace, (4) run more races in the last year, (5) stretched before running, and (6) not participated regularly in other sports
Koplan et al., 1982[104]	Cross-sectional	Running	1423 (♂:693, ♀: 730), recreational, ♂: 33.4 years, ♀: 29.9 years (mean)	Modified training / medication use / medical attention		Self-reported injuries, load (weekly mileage, number of years running), demographic and lifestyle information captured through questionnaire	Y		Y					Y			• The risk of injury increased with increasing weekly mileage • This trend was similar for men and women, for all types of injuries, and for those injuries that led to a medical consultation • Injuries were not independently associated with age, speed, BMI, or years of running

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