

Appendix 2. General study characteristics of the 20 studies included in the scoping review.

Study	Study Design	Country of Origin	Aim of Study	Method of Testing	Participants (n)	Age (mean \pm SD)	Sex/Gender (n)	Sport	Activity Level/Competition
Andreoli 2012	Retrospective Study	International (Multiple)	To determine effect of prior youth sport participation on BMD/BMC and body composition in women compared with sedentary controls, and to evaluate if the positive effects of past sports participation persisted during menopause and aging.	In-Person Testing	Running FA: n = 12, Swimming FA: n = 12, Controls: n = 24	Running FA: 57.8 \pm 6.4 years, Swimming FA: 58.4 \pm 8.8 years, Controls: 60.8 \pm 6.7 years	FA: n = 24 females, Controls: n = 24 females	FA: running and swimming, Controls: none	FA: exercised regularly for \geq 3 hours/day, 4 days/week and competed at national and international levels, Controls: participated in activities 1-2x/month, but not in a competitive sport environment, overall physical activity never exceeded 1 hour/week
Arliani 2014	Cross sectional study	Brazil	To compare prevalence of OA in former professional soccer players and non-professional athlete participants.	In-Person Testing	FA: n = 27, Controls: n = 30	FA: 45.67 \pm 5.91 years, Controls: 43.7 \pm 6.15 years	FA: n = 27 males, Controls: n = 30 males	FA: soccer, Controls: played soccer and other sports recreationally	FA: professional first division for at least 5 years, Controls: volunteers from different non-sports professional areas
Babaei 2014	Cross sectional study	Iran	To evaluate the basal BDNF level and memory performance, and reaction of BDNF regulation system to acute aerobic and anaerobic training in athletes and sedentary groups.	In-Person Testing	FA Aerobic Group: n = 10, FA Anaerobic Group: n = 9, Controls Aerobic Group: n = 10, Controls Anaerobic Group: n = 10	FA Aerobic Group: 51.40 \pm 3.40 years FA Anaerobic Group: 51.33 \pm 4.18 years, Controls Aerobic Group: 53.70 \pm 6.11 years, Controls Anaerobic Group: 52.60 \pm 5.14 years	Not stated	FA: soccer, Controls: none	FA: elite regular training 3x/week, competed at domestic soccer championships for at least 10 years, Controls: no regular physical activity

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Batista 2013	Cross sectional study	Portugal	To investigate whether former athletes protected against metabolic syndrome and if this is dependent on sex, career, or later lifestyle.	In-Person Testing	Elite FA: n = 225, Non-Elite FA: n = 168, Controls: n = 98	Total Elite FA: 48.3 \pm 12.5 years, Total Non-Elite FA: 50.6 \pm 16.3 years, Total Controls: 51.5 \pm 18.1 years Male Elite FA: 49.8 \pm 12.5 years, Male Non-Elite FA: 49.3 \pm 15.5 years, Male Controls: 51.9 \pm 18.3 years Female Elite FA: 46.6 \pm 12.4 years, Female Non-Elite FA: 52.4 \pm 17.4 years, Female Controls: 51.1 \pm 18.0 years	Total FA: n = 267 males, n = 224 females, Elite FA: n = 117 males, n = 108 females, Non-Elite FA: n = 99 males, n = 69 females, Controls: n = 49 males, n = 49 females	FA: Judo, canoeing, rowing, sprinting, middle- and long-distance running, archery, triathlon, decathlon, swimming, basketball, handball, soccer, volleyball, gymnastics, field events (throwing and jumping), Controls: Non-athletes	Elite FA: represented Portugal between 1969-2005 at least once in the Olympic Games, World/European championships, or other international competitions, Non-Elite FA: competed at least for 3 consecutive years in their adult life, but never represented Portugal, Controls: randomly selected in Portuguese population
Batista 2014	Cross sectional study	Portugal	To examine whether the development of behavioral and biological risk factors of elite FA, differed from non-elite FA and non-athletes.	In-Person Testing	Elite FA: n = 225, Non-Elite FA: n = 168, Controls: n = 98	Total Elite FA: 48.3 \pm 12.5 years, Total Non-Elite FA: 50.6 \pm 16.3 years, Total Controls: 51.5 \pm 18.1 years Male Elite FA: 49.8 \pm 12.5 years, Male Non-Elite FA: 49.3 \pm 15.5 years, Male Controls: 51.9 \pm 18.3 years Female Elite FA: 46.6 \pm 12.4 years, Female Non-Elite FA: 52.4 \pm 17.4 years, Female Controls: 51.1 \pm 18.0 years	Total: n = 267 males, n = 224 females	FA: Judo, canoeing, rowing, sprinting, middle- and long-distance running, archery, triathlon, decathlon, swimming, basketball, handball, soccer, volleyball, gymnastics, field events (throwing and jumping), Controls: Non-athletes	Elite FA: represented Portugal at least once in the Olympic Games, World/European championships, or other international competitions, Non-Elite FA: competed in selected sports but at no time represented Portugal, Controls: randomly selected from the national phonebook contacts

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Chang 2009	Cross sectional study	United States	To compare CV risk factors and coronary atherosclerosis in retired NFL players to those in community controls.	In-Person Testing	DHS FA: n = 150, ACLS FA: n = 200, DHS Controls: n = 150, ACLS Controls: n = 400	DHS FA: 51.2 \pm 9.7 years, ACLS FA: 55.2 \pm 11.9 years, DHS Controls: 51.1 \pm 9.5 years, ACLS Controls: 52.5 \pm 11.9 years	DHS FA: n = 150 males, ACLS FA: n = 200 males, DHS Controls: n = 150 males, ACLS Controls: n = 400 males	FA: American professional football, Controls: none	FA: competed in National Football League (NFL) with 21.8 \pm 10.1 years since retirement, Controls: not specified, individuals from national studies
Dey 2002	Cross sectional study	India	To evaluate the effects of present-day total physical activity on selected CAD risk factors including obesity, lipids and blood pressure of older former athletes and their comparison with sedentary non-athletes	In-Person Testing	PAFA: n = 52, SFA: n = 54, Controls: n = 56	PAFA: 45.9 \pm 4.75 years, SFA: 42.7 \pm 4.67 years, Controls: 46.07 \pm 5.26 years	FA: n = 106 males, Controls: n = 56 males	FA: soccer, Controls: none	PAFA: 12-15 year career at state, national, and international competitions, after retirement engaged in coaching capacity, individual physical training/sports for at least 1-2 hour/day, 4-5 days/week; SFA: 12-15 year career, after retirement engaged in government or private sector jobs with sedentary lifestyle, Controls: no past athletic training, except occasional recreational sports, and currently with a sedentary lifestyle and job.
Grashow 2022	Cohort study	United States	To examine the relationships between age, health span and chronic illness among former professional American-style football players.	Internet or Email	FA: n = 2684, NHANES Controls: 1481, NHIS Controls: 6298	FA: 43.9 \pm 9.6 years, NHANES Controls: 42.3 \pm 10.4 years, NHIS Controls: 43.1 \pm 10.2 years	FA: n = 2684 males, NHANES Controls: n = 1481 males, NHIS Controls: n = 6298 males	FA: American professional football, NHANES and NHIS Controls: none	FA: competed in National Football League (NFL) after 1960, NHANES and NHIS Controls: individuals from national surveys, activity level not specified

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Hagmar 2006	Cross sectional study	Sweden	To characterize endothelial function in post-menopausal elite FA compared with sedentary controls; to study the influence of hormone replacement therapy (HRT) on endothelial function in these groups of women.	In-Person Testing	FA: n = 20, Controls: n = 19	FA: 56 \pm 3.5 years, Controls: 56.8 \pm 3.4 years	FA: n = 20 females, Controls: n = 19 females	FA: running, swimming, cross-country skiing, and downhill skiing, Controls: none	FA: performed aerobic training for 8 hours each week, competed in international competitions, world record-holder, and the Olympics, Controls: \leq 2 hours of recreational, low-intensity physical activity each week
Hurst 2010	Cross sectional study	United States	To evaluate subclinical atherosclerosis in retired professional football players	Database extraction and in-person testing	FA: n = 201, Controls: n = 123	FA: 50.8 \pm 9 years, Controls: 49.6 \pm 7 years	FA: n = 201 males, Controls: n = 123 males	FA: American professional football, Controls: none	FA: competed in National Football League (NFL), Controls: pulled from Mayo Clinic database
Kettunen 2001	Cross sectional study	Finland	To investigate the association between participation in sports during adolescence and adulthood and self-reported lower-limb pain and disability in older men.	Mail	Endurance FA: n = 141, Track and Field FA: n = 230, Team Sport FA: n = 262, Power Sport FA: n = 301, Marksmen FA: n = 57, Controls: n = 577	Endurance FA: 68.8 \pm 9.4 years, Track and Field FA: 64.4 \pm 9.3 years, Team Sport FA: 61.8 \pm 8.3 years, Power Sport FA: 64.5 \pm 8.3 years, Marksmen FA: 70.7 \pm 10.8 years, Controls: 62.4 \pm 8.1 years	FA: n = 991 males, Controls: n = 557 males	FA: endurance (long-distance running, cross-country skiing), power sport (boxing, wrestling, weightlifting, throwing), track and field (jumping, sprinting, hurdle, middle-distance running, decathlon events), team sport (soccer, ice hockey, and basketball), marksmen, Controls: none	FA: competed at least once in Olympic Games, World or European Championships, or international competitions between 1920 and 1965, Controls: healthy at military induction physicals

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Kettunen 2010	Cross-sectional study with retrospective and prospective components	Finland	To investigate whether athletic training and elite competition show a reduced risk for hip fracture during two decades of follow-up, and if a lifelong physically active lifestyle is reflected in femoral bone mineral density measured at older age.	1985 mail questionnaire, 1992 clinical examinations	Soccer FA: n = 31, Endurance Running FA: n = 28, Weightlifting FA: n = 28, Controls: n = 774	Total FA: 56.8 \pm 10 years, Soccer FA: 56.5 \pm 5.7 years, Endurance Running FA: 59.7 \pm 4.7 years, Weightlifting FA: 59.2 \pm 5.3 years, Controls: 55.2 \pm 10.3 years	FA: n = 1271 males, Controls: n = 774 males	FA: Long-distance running, cross country skiing, soccer, ice hockey, basketball, track and field, boxing, wrestling, weightlifting, Controls: none	FA: competed at least once in Olympic Games, World or European Championships, or international competitions between 1920 and 1965, Controls: healthy at military induction physicals
Majerczak 2019	Cross sectional study	Poland	To assess the impact of long-lasting professional physical training performed when young on the endothelial function and arterial stiffness reported in older age in relation to glycocalyx injury, prostacyclin and nitric oxide production, inflammation	In-Person Testing	Endurance FA: n = 16, Former Sprint FA: n = 15, Controls: n = 16	Endurance FA: 60.4 \pm 8.2 years, Sprint FA: 59.1 \pm 6.2 years, Controls: 60.6 \pm 6.7 years	FA: n = 31 males, Controls: n = 16 males	FA: sprint and endurance events, Controls: none	FA: professional physical training and competed at a national and international level, including country championships, world championships, and the Olympics, Controls: untrained
Pihl 2003	Cross sectional study	Estonia	To analyze the status of oxidative stress, hsCRP level, and other CV risk factors in FA, and to the physical activity level following retirement.	In-Person Testing	PAFA: n = 29, SFA: n = 24, Controls: n = 25	PAFA: 47.5 \pm 7.2 years, SFA: 48.6 \pm 6.9 years, Controls: 47.7 \pm 6.7 years	FA: n = 53 males, Controls: n = 25 males	FA: endurance sports, Controls: no competitive sport history	PAFA: previous competition at international or national, currently exercising regularly \geq 3x/week, SFA: previous competition at international or national, currently exercising <3x/week, Controls: fellow workers of the FA

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Raty 2002	Cross sectional study	Finland	To compare elite male FA with community control subjects to evaluate the effects of recent physical activity and of lifetime participation in sports on dynamic balance	In-Person Testing	Soccer FA: n = 28, Weightlifting FA: n = 24, Running FA: n = 26, Marksmen FA: n = 27, 47-year-old Controls: n = 212, 57 year old Controls: n = 197	Soccer FA: 56.2 \pm 5.6 years, Weightlifting FA: 59.0 \pm 5.4 years, Running FA: 59.9 \pm 4.6 years, Marksmen FA: 61.0 \pm 4.4 years, Controls: stratified by ages 27, 37, 47, 57, 67	FA: n = 105 males, Controls: n = 409 males	FA: Soccer, weightlifting, long-distance running, marksmen, Controls: none	FA: represented Finland at least once in an international competition, Controls: light physical activity, drawn from the population register of the city of Turku, Finland
Ravi 2020	Retrospective descriptive	Finland	To investigate the associations between competitive sport participation in adolescence and age at menarche with middle-aged; and if the lifetime occurrence of fractures, current musculoskeletal problems, and anorexia nervosa differed	In-Person Testing	Competitive FA: n = 136, Regular Physical Activity Controls: n = 689, No Exercise Controls: n = 163	Competitive FA: 50.9 years [50.5-51.2], Regular Physical Activity Controls: 51.4 years [51.3-51.6], No Exercise Controls: 51.6 years [51.3-51.9]	Competitive FA: n = 136 females, Regular Physical Activity Controls: n = 689 females, No Exercise Controls: n = 163 females	Competitive FA: track and field (28.7%), volleyball (20.6%), cross-country skiing (18.4%), running (16.9%), Finnish baseball (7.4%), and gymnastics (7.4%), Controls: none	Competitive FA: regular competitive sport and training at age 13-16, Regular Physical Activity Controls: regularly physically active from age of 13-16, No Exercise Controls: did not perform exercise at age 13-16
Schmitt 2004	Cross sectional study	Germany	To determine which symptomatic changes occur in the hip joints of elite javelin throwers and high jumpers after their retirement compared with matched controls	In-Person Testing	Javelin Throwing FA: n = 19, High Jumping FA: n = 22, Controls: n = 41	Javelin Throwing FA: 52 years [40-59], High Jumping FA: 47 years [42-57], Javelin Throwing Controls: 51 years [40-58], High Jump Controls: 48 years [40-58]	FA: n = 41 males, Controls: n = 41 males	FA: Javelin throwing and high jump, Controls: not specified	FA: Former Olympic and world champions, world record holders and national top athletes, Controls: sports activity \leq 2x/week and no participation in competitions

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Simon 2017	Cross sectional study	United States	To evaluate differences in current physical fitness in former National Collegiate Athletic Association (NCAA) Division I athletes and nonathletes.	In-Person Testing	FA: n = 100, Controls: n = 100	FA: 53.1 \pm 7.4 years, Controls: 51.4 \pm 7.3 years	FA: n = 60 men, n = 40 women, Controls: n = 60 men, n = 40 women	FA: Football n = 30, Diving n = 2, Basketball n = 8, Field Hockey n = 3, Wrestling n = 3, Gymnastics n = 6, Soccer n = 7, Volleyball n = 9, Cross Country n = 3, Softball n = 2, Baseball n = 3, Track and Field n = 9, Rifle n = 1, Rowing n = 1, Swimming n = 8, Tennis n = 5, Controls: Basketball n = 7, Field Hockey n = 4, Gymnastics n = 5, Soccer n = 8, Volleyball n = 6, Baseball n = 6, Swimming n = 10, Tennis n = 6, Ice Hockey n = 4, Competitive cycling n = 15, Physical Activity Regularly n = 24, Army ROTC n = 5	FA: competed in NCAA Division I for 2-5 years, n = 30 professional level, Controls: were recreationally active but played intramural sports, played club sports, or participated in other recreational activity on a regular basis (3-5x/week) while in college

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Stracciolini 2020	Cross sectional study	United States	To investigate associations between sports participation by Division III collegiate female athletes and later life health outcomes and quality-of-life measures.	Internet or Email	FA: n = 697, Controls: n = 900	FA <40 years: n = 190, Controls <40 years: n = 160, FA 40-44 years: n = 114, Controls 40-44 years: n = 129, FA 45-49 years: n = 152, Controls 45-49 years: n = 125, FA 50-54 years: n = 129, Controls 50-54 years: n = 206, Controls 55-59 years: n = 154, Controls 60-64 years: n = 70, Controls 65-70 years: n = 54, Controls >70 years: n = 2	FA: n = 697 females, Controls: n = 900 females	FA: NCAA Division III sport (not specified), Controls: not stated	FA: NCAA Division III level, Controls: no college sport participation
Unt 2008	Cross sectional study	Estonia	To investigate the level of homocysteine (Hcy) and glutathione redox ratio in relation to physical activity and cardiorespiratory fitness in former top-level athletes and controls.	In-Person Testing	PAFA: n = 52, SFA: n = 25, Controls: n = 33	PAFA: 44.7 \pm 6.7 years, SFA: 49.4 \pm 6.0 years, Controls: 48.4 \pm 7.8 years	FA: n = 77 males, Controls: n = 33 males	FA: endurance sports, Controls: none	PAFA: competed at international or national level at least 15 years ago, currently exercising regularly \geq 3x/week, SFA: competed at international or national level at least 15 years ago, currently physically active $<$ 3x/week, Controls: currently physically inactive and no competitive sports history, mostly fellow workers of former athletes