## Appendix 1- Characteristics of studies that met the inclusion criteria

Study	Participant Characteristics	Sport(s)	Assessment Method(s)	Follow-up
(55)	Age: 13-18 Male 72: Female 58 Concussed 130: Control O	Unknown	Buffalo Concussion Treadmill Test	<6 Weeks
(56)	Age: 12-17 Male 29: Female 7 Concussed 36: Control O	Ice Hockey	Biomarkers, SCAT3	<6 weeks
(57)	Age: <18 Male 47: Female 18 Concussed 65: Control O	Unknown	Unspecified Graded Exercise Test	n/a
(25)	Age: 5-18 Male 179: Female 253 Concussed 432: Control O	Unknown	PCSS, Dual- task tandem gait, VOMS	n/a
(40)	Age: 15 Male 26: Female 14 Concussed 19: Control 16	Ice Hockey and US Football	Isometric handgrip exercise	<3 months
(58)	Age: 8-18 Male 210: Female 108 Concussed 318: Control O	Ice Hockey, US Football, Soccer and Basketball	Post-Concussion Symptom Scale	<6 weeks
(59)	Age: 13-19 Male 19: Female 7 Concussed 13: Control 13	Contact Sports	Brain functional connectivity	<6 weeks
(60)	Age: 12-18 Male 55: Female 64 Concussed 65: Control 54	Soccer, Hockey, Rugby, Basketball, US Football, Other	ImPACT and PCSS	<3 months
(61)	Age: n/a Male 323: Female 96 Concussed 14: Control 405	US Football, Wrestling, Basketball, Soccer, Baseball	ANAM	<10 days

(62)	Age: 13-18 Male 20: Female 20 Concussed 20: Control 20	Unknown	Self-reported graded symptom checklist and AS Index-3	<6 weeks
(63)	Age: <18 Male 51: Female 7: Unreported 12 Concussed 70: Control O	US Football, Basketball, Cheer, Soccer, Wrestling, Volleyball, Unreported	Patient-reported outcomes measurement information system pediatric-25	<3 weeks
(48)	Age: 6-18 Male 97: Female 73 Concussed 126: Control 58	Unknown	Health and Behaviour Inventory, mBESS, single and dual task tandem gait	<3 months
(47)	Age: 8-18 Male 39: Female 28 Concussed 36: Control 31	Unknown	PCSS, Dual-Task gait, event related potentials and eye tracking	<3 months
(64)	Age: 14-19 Male 93 : Female 14 Concussed 30: Control 77	Unknown	Event related potential (auditory oddball task), captured with EEG called processing negativity	<3 months
(65)	Age: Grade 9-12 Male 995 : Female 3 Concussed 62: Control 1114	US Football	PCSS, Patient health questionnaire 9 and pediatric quality of life inventory 4.0	<1 year
(66)	Age: n/a Male 64 : Female 0 Concussed 8: Control 0	US Football	Cogstate, Brain Network Activation, Clinical Reaction Time, SCAT3 self-reported symptoms and Health Behaviour Inventory and Satisfaction with Life Scale	<6 months
(42)	Age: 15-17 Male 3 : Female 3 Concussed 6: Control 0	Soccer, Ice Hockey, US Football, Cycling	MRI	<1 year
(67)	Age: 13-16 Male 67 : Female 33 Concussed 100: Control O	Soccer, US Football, Basketball, Wrestling, Cross Country, Tennis, Ice Hockey, Volleyball,	ImPACT	<6 weeks

		Baseball, Softball, Cheer, Lacrosse, Athletics, Field Hockey, Gymnastics, Unknown		
(68)	Age: 5-17 Male 157 : Female 63 Concussed 220: Control O	Unknown	Post-concussion symptom inventory and CogSport	<3 weeks
(69)	Age: 13-18 Male 48 : Female 28 Concussed 46: Control 20	Unknown	King-Devick and Graded Treadmill test	<3 weeks
(70)	Age: 14-18 Male 30: Female 0 Concussed 16: Control 12	US Football	Resting state functional MRI, Diffusion tensor imaging and ImPACT	<6 weeks
(26)	Age: 9-18 Male 26 : Female 8 Concussed 14: Control 20	Unknown	Three-dimensional multiple object tracking	<6 months
(10)	Age: <19 Male 238 : Female 161 Concussed 399: Control O	Soccer, Ice Hockey	VOD, NPC, Smooth pursuits, saccades, VOR.	n/a
(24)	Age: 5-18 Male 138 : Female 76 Concussed 213: Control O	Unknown	Post-Concussion Symptom Scale	<10 days
(28)	Age: 11-16 Male 10 : Female 1 Concussed 11: Control O	Unknown	Post-Concussion Symptom Scale and Balance Assessment	<6 weeks
(27)	Age: 11-16 Male 38 : Female 7 Concussed 25: Control 20	Unknown	Biomarker and PCSS	<6 weeks
(49)	Age: n/a Male 217 : Female 77 Concussed 105: Control O	US Football, Basketball, Soccer, Cheer, Other	SCAT-2 and Balance Testing	n/a
(37)	Age: 11-18 Male 238 : Female 123	US Football, Wrestling, Lacrosse,	Impact	n/a

	Concussed 361: Control	Soccer, Basketball,		
	0	ICE HOCKEY, Volleyball Field		
		Hockey Cheer		
		Other		
(71)	Age: <19	Baseball, Basketball,	PCSS and Ocular Examination	<3 months
	Male 63 : Female 38	Skating, US Football,		
	Concussed 77: Control	Ice Hockey,		
	0	Ringette, Snow		
		Sports, Soccer,		
		Volleyball, Other		
(72)	Age: 14-17	US Football, Soccer,	Motion gait analysis while	<3 months
	Male 34 : Female 4	Volleyball	simultaneously performing a	
	Loncussed 19: Control		cognitive task.	
	19			
(73)	Age: n/a	US Football, Soccer,	Dual-task walking protocol	<3 months
	Male 20 : Female 3	Wrestling,		
	Concussed 23: Control	Volleyball		
	23			
(74)	Age: 12-19	Basketball, Cheer,	King-Devick, PCSS, ImPACT	<6 months
	Male 17 : Female 18	US Football,		
	Concussed 35: Control	Gymnastics, Soccer,		
	0	Wrestling, Other		
(75)	Δσρ. 13-18	LIS Football Soccer	No specific diagnostic criteria	<3 months
(75)	Male 1088 · Female 324	Baskethall	No specific diagnostic criteria	
	Concussed 1412:	Wrestling, Baseball.		
	Control 0	Softball, Volleyball		
(50)	Age: 16-17	US Football, Soccer,	Graded Symptom Checklist,	<3 months
	Male 507 : Female 63	Lacrosse, Ice	BESS, SAC and a brief	
	Concussed 570: Control	Hockey	neuropsychological test battery	
	166			
(76)	Age: 11-17	Soccer, US Football,	ImPACT, MRI, DTI	<6 weeks
	Male 18 : Female 6	Wrestling		
	Concussed 12: Control			
	12			
(77)	Age: 14	Field Hockey	ImPACT, Attention Network	<6 weeks
	Male 0 : Female 2		Test	
	Concussed 2: Control 0			
1				l a ·
(78)	Age: n/a	Baseball, Basketball,	IMPACT	<6 weeks

(78)	Age: n/a	Baseball, Basketball,	Impact	<6 weeks
	Male 58 : Female 14	Cheer, US Football,		
	Concussed 72: Control	Gymnastics, Ice		
	2000	Hockey, Soccer,		
		Softball, Volleyball,		
		Wrestling		

(79)	Age: 13-18 Male 76 : Female 12 CC 64: CT 24	US Football, Basketball, Soccer and Other	Impact	<10 days
(80)	Age: 12-18 Male 15 : Female 7 Concussed 10: Control 12	Running, Volleyball, US Football, Baseball, Wrestling, Swimming, Skateboard, Soccer, Basketball	DTI and MRI	<3 months
(81)	Age: n/a Male 108 : Female 0 Concussed 108: Control 0	US Football	PCSS and ImPACT	<3 weeks
(60)	Age: 11-18 Male 86 : Female 23 Concussed 109: Control O	US Football, Basketball, Soccer, Baseball, Wrestling, Other	PCSS and ImPACT	<3 weeks
(47)	Age: 8-18 Male 25 : Female 25 Concussed 23: Control 27	Unknown	Single/dual task tandem gait and PCSS	<3 weeks
(82)	Age: 14-19 Male 37 : Female 17 Concussed 27: Control 27	Unknown	Buffalo Concussion Treadmill Test	<3 weeks
(83)	Age: 13-17 Male 23 : Female 12 Concussed 15: Control 20	Unknown	Physical and Neurological Examination of Subtle Signs	<6 months
(84)	Age: 11-12 Male 13 : Female 1 Concussed 14: Control O	Ice Hockey	Physical and Neurological Examination of Subtle Signs	<6 weeks
(85)	Age: 12-16 Male 103 : Female 36 Concussed 139: Control O	Australian Rules Football, Rugby, Other, Fall during play, Riding, Cycling, Equestrian, Skating, Other	VOMS, M-BESS, ImPACT and a concussion symptom-limited graded exercise test.	<6 weeks

(86)	Age: 13-18	Unknown	King-Devick, BCTT and PCSS	<6 weeks
	Male 52 : Female 47			
	Concussed 99: Control			
	0			

(87)	Age: 14-18 Male 44 : Female 19 Concussed 63: Control O	US Football, Basketball, Cheer, Soccer, Wrestling	VOMS and NPC	<3 weeks
(41)	Age: 12-18 Male 15 : Female 22 Concussed 19: Control 18	Unknown	MRI, SCAT-3 and GAD-7	<3 months
(88)	Age: n/a Male 94 : Female 0 Concussed 94: Control O	US Football	Global rating questions, Pediatric quality of life inventory, multidimensional fatigue scale, and headache impact test 6	<6 weeks
(51)	Age: 10-17 Male 1242 : Female 598 Concussed 1733: Control 0	US Football, Soccer, Basketball, Wrestling, Lacrosse, Hockey, Volleyball, Cheer, Baseball, Softball, Other	Patient survey symptom score, BESS, SAC, Cogstate	n/a
(89)	Age: n/a Male 481 : Female 433 Concussed 77: Control 77	US Football, Cheer, Soccer, lacrosse, Basketball, Wrestling, Volleyball, Field Hockey, other	Impact	<3 months
(90)	Age: n/a Male 30 : Female 20 Concussed 25: Control 25	Ice Hockey, Basketball, Soccer	ClinicaVR: Classroom-CPT and the VIGIL-CPT	<1 year
(91)	Age: <19 Male 235 : Female 116 Concussed 351: Control O	US Football, Basketball, Soccer, Lacrosse, Basketball, Ice Hockey, baseball, Volleyball	Health Behavior inventory, headache severity rating, sleep disturbance questionnaire, BESS, Romberg, tandem gait, ocular assessment	<1 year
(52)	Age: n/a Male 90 : Female 0 Concussed 59: Control 31	US Football	Concussion symptom inventory, SAC, BESS, ANAM, EEG	<6 weeks

(5)	Age: 5-18	Unknown	ImPACT, VOMS	Follow-up:
	Male 143 : Female 104			n/a
	Concussed 247: Control			
	0			
(44)	Age: 13-19	US Football, Soccer,	SCAT2, ANAM or ImPACT, and	<6 weeks
	Male 110 : Female 37	Ice Hockey,	BCTT	
	Concussed 147: Control	Lacrosse, Softball,		
	0	Basketball		

(92)	Age: 8-17 Male 144 : Female 54 Concussed 198: Control 0	Basketball, Canadian Football, Soccer, Rugby, Ice Hockey	SCAT2	n/a
(93)	Age: 12-19 Male 51 : Female 18 : Unreported 12 Concussed 95: Control O	US Football, Soccer, Ice Hockey, Volleyball, Field Hockey, Rugby, Basketball, Wrestling	ImpACT, PCSS	<6 weeks
(94)	Age: 13-18 Male 35 : Female 8 Concussed 43: Control 0	US Football, Soccer, Basketball, Ice Hockey, Lacrosse, Baseball, Softball	ImPACT	<10 days
(95)	Age: 10-17 Male 149 : Female 56 : Unreported 1 Concussed 206: Control 15	Hockey, Soccer, lacrosse, Basketball, Baseball, US Football, Other	ImPACT and an Ocular assessment	<1 year
(96)	Age: 14-18 Male 36 : Female 4 Concussed 20: Control 20	US Football, Soccer, Volleyball, Wrestling, Basketball	Dual-task walking	<3 months
(97)	Age: 13-18 Male 18 : Female 14 Concussed 32: Control 0	Ice Hockey	ImPACT, PCSS	<3 months
(98)	Age: n/a Male 36 : Female 4 Concussed 20: Control 20	US Football, Soccer, Volleyball, Wrestling, Basketball	Attentional Network Test	<3 months
(99)	Age: 11-14 Male 17 : Female 0 Concussed 17: Control 26	Ice Hockey	DTI, MRI	<3 months
(100)	Age: 10-14 Male 17 : Female 4 Concussed 21: Control 0	Ice Hockey	Verbal and non-verbal working memory task, PCS- R	<3 months

(11)	Age: 13-19	US Football	ImPACT	<3 months
	Male 108 : Female 0 :			
	U69			
	Concussed 177: Control			
	0			
(101)	Age: n/a	Basketball, Cheer,	Imaging and PCSS	<3 months
	Male 12 : Female 28	US Football, Ice		
	Concussed 20: Control	Hockey, Soccer,		
	20	Softball, Volleyball,		
		Other		

(102)	Age: 13-19 Male 138 : Female 0 Concussed 138: Control 0	US Football	Impact	<3 weeks
(53)	Age: 11 Male 0 : Female 1 Concussed 1: Control 0	Snowboarding	Balance subtest of Bruininks- Oseretsky Test of Motor Proficiency, the pediatric clinical test of sensory interaction for balance, the postural stress test	<3 months
(1)	Age: 15-19 Male 131 : Female 0 Concussed 16: Control 115	Rugby Union	SCAT3, Cogstate, King-Devick Test	<6 weeks
(2)	Age: 13.83 (±2.02) Male 17 : Female 23 Concussed 40 : Control 0	Soccer, American Football	BESS correlated with center-of- pressure (COP) measures.	<6 weeks
(3)	Age: 13-18 Male 80 : Female 45 Concussed 125: Control 2035	US Football, Basketball, Volleyball, Soccer	PHQ9, SCAT5.	<1 year
(4)	Age: 12-19 Male 9 : Female 8 Concussed 17 : Control 0	Unknown	Sleep Movement via Accelerometer, PCSS	<6 weeks
(5)	Age: 15-19 Male 135 : Female 0 Concussed 15 : Control 120	Rugby Union	M-BESS, MRI	<1 Week

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