

**Table 1:** Summary of Systematic Review Studies.

	<b>Bailey et al., 2019 [36]</b>	<b>Chan et al., 2018 [35]</b>
<b>Study Design</b>	Pilot RCT	RCT
<b>Study Participants</b>		
Sample Size	Total 15 participants (6 females, 9 males)	Total 19 participants (14 females, 5 males)
Age in years (SD)	Mean age = 15.75 (1.39) Range = 14-18	Range = 12-18
Athlete (Y/N)	N/A	Yes
<b>Mechanism of Injury</b>	56% SRC 44% Other (falls, MVA, recreational sports)	SRC
<b>Time between injury and recruitment (SD)</b>	≥ 4 weeks post injury Mean 56 days (29.33)	≥ 1-month post injury Mean 132 days (52.0)
<b>Intervention Investigated</b>	<i>Treatment:</i> Subthreshold exercise performed 20 min daily at 80% HR threshold identified by incremental treadmill test <i>Control:</i> Light exercise (stretching/walking) performed 20 min daily	<i>Treatment:</i> Active rehabilitation program with 4 components: (1) sub-maximal aerobic training, (2) light coordination/sport specific exercise, (3) visualization and imagery, (4) home exercise program. <i>Control:</i> Treatment as usual – educational session with OT, school consultation, psychiatrist consultation.
<b>Intervention Duration</b>	6 weeks	6 weeks
<b>Symptom Scale</b>	PCS Scale-Revised (PCS-R)	PCS scale
<b>Symptom Scores: mean (SD)</b>	<i>Total % change in PCS-R Score (after removing influence of depression)</i> <b>EXG</b> = -63.3% (17.4) <b>Control</b> = -56.8% (27.8)	<i>Change in total PCS-score</i> <b>EXG</b> = -24.7 (19.1) <b>Control</b> = -15.8 (12.5)
<b>Main Findings</b>	Reduction in symptom scores in both groups. After removing influence of depression, intervention had large effect ( $F = 5.20, p < .05$ , partial $\eta^2 = 0.32$ ) on symptom reduction, with participants in intervention group improving more than those in control group.	Adverse events were no more common in participants receiving the active rehabilitation intervention, however, upon review were determined to be unrelated to intervention. Both treatment and control groups saw an improvement in symptoms (Cohen's $d = 0.55$ ), but the treatment effect on PCS was found statistically significant.

Table 1 (continued...)

	Chrisman et al., 2017 [7]	Dobney et al., 2017 [9]	Dobney et al., 2018 [38]
<b>Study Design</b>	Retrospective chart review	Prospective cohort study	Case series
<b>Study Participants</b>			
Sample Size	Total 83 participants (45 females, 38 males)	Total 277 participants (135 females, 142 males)	Total 677 participants (367 females, 310 males)
Age in years (SD)	Mean age = 14.9 (2.3)	Mean age= 14.1 (2.3)	Mean age = 14.3 (2.3) Range = 7-18
Athlete (Y/N)	Mixed	N/A	N/A
<b>Mechanism of Injury</b>	76% SRC 11% MVA 6% Non-sport fall 7% Other	78% SRC 22% Other	N/A
<b>Time between injury and recruitment (SD)</b>	≥ 1 month, but ≤ 300 days after concussion	3-4 weeks post injury Mean = 28 days (3.3)	2-6 weeks post injury
<b>Intervention Investigated</b>	<i>Treatment:</i> Sub-symptom threshold exercise program (SSTEP). Based on Leddy et al. (2010; 2013). Performed aerobic exercise at daily at 80% HR threshold, determined by Balke treadmill test, for max 20 min (or equivalent time exercised during test).	<i>Treatment:</i> Based on protocol by Gagnon et al. (2009). Active rehabilitation protocol with 4 components: (1) aerobic exercise (15 min/day at 50-60% age predicted max HR, (2) coordination/skill practice (max 10 min/day), (3) visualization, (4) education.	<i>Treatment:</i> Based on protocol by Gagnon et al. (2009). Active rehabilitation protocol performed daily with 4 components: (1) aerobic exercise (15 min at 60% age predicted max HR, (2) coordination/skill practice (max 10 min), (3) visualization (5-10 min), (4) education.
<b>Intervention Duration</b>	Varied	N/A	Varied
<b>Symptom Scale</b>	PCS scale in SCAT-2	PCS scale in SCAT-2; -3	PCS scale-revised from SCAT-3
<b>Symptom Scores: mean (SD)</b>	<i>Mean PCS-scores (SD) reported as an exponential decay</i> Pre-intervention: 36.3 (3.78) Post-intervention: 10.0 (6.07)	<i>Total PCS-score median (IQR)</i> Baseline = 18 (9-34) Post-intervention = 9.5 (3.75-24.25)	<i>Mean PCS-scores by time intervention was implemented (baseline (SD); follow-up (SD))</i> <2 wk.: 25.2 (15.2); 16.7 (11.8) 2 wk.: 20.3 (15.9); 8.4 (10.5) 3 wk.: 22.7 (19.2); 15.2 (17.1) 4 wk.: 25.6 (19.8); 16.0 (17.5) 5 wk.: 26.4 (18.3); 19.9 (17.3) ≥ 6 wk.: 35.2 (23.1); 22.2 (19.7)
<b>Main Findings</b>	Symptom scores improved exponentially following SSTEP intervention. Rate of improvement was not significantly different between groups with differing duration of symptoms at presentation.	Total symptom severity scores and symptom clusters (physical, cognitive, emotional, and sleep-related symptoms) were significantly improved at follow up compared to pre-intervention ( $p < .05$ ). Female sex was associated with increased PCS severity throughout intervention compared to males.	All participants showed significant decrease in symptom severity irrespective of the start time post onset. Patients initiating active rehab at 2 ( $p < .001$ ) or 3 ( $p = .039$ ) weeks post-injury demonstrated lower symptom scores at follow up than participants starting < 2w ( $P = .02$ ), 4w ( $p = .20$ ), or 5w ( $p = .04$ ) post injury, but participants starting <2w or 6w post injury had equivalent outcomes.

Table 1 (continued...)

	Gagnon et al., 2009 [39]	Gauvin-Lepage et al., 2020 [5]	Gauvin-Lepage et al., 2019 [1]
<b>Study Design</b>	Case series	Multicenter prospective quasi-experimental control group design	Retrospective analysis of a prospective cohort
<b>Study Participants</b>			
Sample Size	Total 16 participants	Total 49 participants (26 females, 23 males)	Total 355 participants (188 females, 167 males)
Age in years (SD)	Range = 10-17	Mean age EXG = 13.2 (2.6) Mean age control = 14.0 (1.9) Range = 8-17	Mean age = 14.3 (2.2)
Athlete (Y/N)	N/A	Mixed	Mixed
<b>Mechanism of Injury</b>	SRC (n = 14) Hit/assault (n = 1) Fall (n = 1)	SRC (n = 39) Non-SRC (n = 7) MVA (n = 1) Assault (n = 2)	SRC (n = 313) Non-SRC (n = 36) MVA (n = 5) Assault (n = 1)
<b>Time between injury and recruitment (SD)</b>	≥ 4 weeks post injury Mean = 7.0 weeks (4.1)	≥ 4 weeks post injury	Total: mean = 30.5d (3.7) Females: mean = 31.1d (3.8) Males: mean = 29.7d (3.5)
<b>Intervention Investigated</b>	<i>Treatment:</i> Graded Rehabilitation Program with 4 components: (1) sub-maximal aerobic exercise (50-60% max capacity for 15 min), (2) coordination exercises (10 min), (3) visualization and imagery (5 min), (4) home programme (1 week)	<i>Treatment:</i> Standard of care + active rehabilitation intervention performed daily. Consists of (1) aerobic exercise (15 min at 50-60% max capacity), (2) Coordination exercises (10 min), (3) Mental imagery (5 min), (4) education, (5) home program (20-30 min) <i>Control:</i> Standard of care – rest/light symptom limited activities, education	<i>Treatment:</i> Active rehabilitation protocol and other interventions as needed (e.g. ocular motor and vestibular exercises). ( <i>Did not report duration, intensity, or frequency of exercise</i> )
<b>Intervention Duration</b>	Mean = 4.4 weeks (SD = 2.6)	6 weeks	4 weeks
<b>Symptom Scale</b>	PCS scale-revised	PCS Inventory (PCSI)	PCS scale in SCAT-3
<b>Symptom Scores:</b>	<i>PCS-score mean (SD)</i> Baseline = 30.0 (20.8) Follow-up = 6.7 (5.7)	<i>Children PCSI total-score mean (SD)</i> <b>EXG:</b> baseline = 16.92 (10.59), follow-up = 4.70 (10.18) <b>Control:</b> baseline = 20.89 (18.51), follow-up = 8.11 (14.02)	<i>PCS total-score mean</i> <b>Females:</b> Baseline = 28.5, 2-wk follow-up = 20.8, 4-wk follow-up = 15.4 <b>Males:</b> Baseline = 19.9, 2-wk follow-up = 11.5, 4-wk follow-up = 10.9
<b>Results</b>	Significant decrease in symptoms post-intervention in all participants. Participants recovered on average after 4.4 weeks (SD = 2.6) in program.	Both groups reported decrease in PSC over time (child: $p = .01$ ; parent: $p = .03$ ); however there were no between group differences (child: $p = 0.6$ ; parent: $p = 0.74$ ) which suggests that active rehab does not affect PCS beyond the usual management.	Symptom severity decreased over time for all participants. Males consistently presented fewer significantly fewer symptoms than females across intervention ( $\beta = -8.57$ , 95% CI = -12.43 to -4.72, $p < .000$ ), but females' rate of recovery was faster than males over the follow up period.

Table 1 (continued...)

	Grabowski et al., 2017 [43]	Howell et al., 2020 [44]	Howell et al., 2016 [10]
<b>Study Design</b>	Retrospective cohort study	Longitudinal cohort study	Prospective cohort study
<b>Study Participants</b>			
Sample Size	Total 25 participants (14 females, 11 males)	Total 72 participants (33 females, 39 males)	Total 364 participants (142 females, 222 males)
Age in years (SD)	Mean age = 15 Range = 12-20	Mean age = 20.2 (1.3)	Mean age 15.0 (2.8) Range = 8-24
Athlete (Y/N)	Yes	Yes	Yes
<b>Mechanism of Injury</b>	SRC	SRC	SRC; or mechanisms similar to sport
<b>Time between injury and recruitment (SD)</b>	Mean = 41d Range = 21-288d	Within 48 hours of injury	Within 21 days post injury Mean = 11.8d (5.4)
<b>Intervention Investigated</b>	<i>Treatment:</i> Physical therapy intervention with 4 components; (1) cardiovascular exercise (5-6 days per week, same duration and 80% HR threshold achieved during GXT), (2) Vestibular/oculomotor exercise (daily), (3) Cervicothoracic manual therapy (daily), (4) sport specific training(only once max GXT was achieved symptom free)	Participants were grouped based on whether they reported participating in exercise between time of injury and follow up evaluation or not. <i>Treatment:</i> Decision regarding post-concussion exercise was made by sports medicine team and was independent to study. Those given exercise recommendation was prescribed 10-15 min exercise at self-selected pace on stationary bike, or light jogging on treadmill. <i>Control:</i> No reported exercise.	Physical activity levels were self-reported during each follow-up visit using Physical activity scale adapted from RTP protocol in Consensus Statement on Concussion in Sport [24].
<b>Intervention Duration</b>	Mean duration = 84d Range 7-266d	1 week	Varied
<b>Symptom Scale</b>	PCS scale	PCS scale	PCS scale adapted from SCAT-2
<b>Symptom Scores:</b>	<i>PCS-score total mean (SD)</i> Baseline = 18.2 (14.2) Follow-up = 9.1 (10.8)	<i>Median change in PCS-score (IQR)</i> EXG: -4.5 (-12.5, 2) No-EXG: -1.0 (-11, 3)	<i>PCS severity mean (SD)</i> <b>Baseline:</b> Initial period rest = 36.2 (26.5) No initial period rest = 30.3 (23.3) <b>First follow-up:</b> Complete rest = 26.1 (28.7) Minimal/moderate = 10.5 (17.2) Sport-specific = 4.2 (8.6) Full athletic activity = 1.4 (3.1)
<b>Results</b>	Significant decrease in total symptom scores following intervention ( $p < 0.01$ ).	Both EXG and no-EXG groups had a median = 13d to symptom resolution. Change in PCS scores at acute post-injury assessment were similar between groups (EXG median = 18.5 vs. no-EXG median = 17). Once scores were adjusted for time from injury to assessment, PCS scores were significantly lower for the EXG compared to no-EXG across both assessments ( $p = .044$ ).	Mean symptom duration was 48.9 days after injury. Total PCS score at initial clinic visit and female sex were independently associated with longer duration of symptoms, but amount of physical activity after injury was not. For adolescent participants (age 13-18y) higher levels of physical activity after injury was associated with shorter symptom duration.

Table 1 (continued...)

	Imhoff et al., 2016 [2]	Kurowski et al., 2017 [8]	Leddy et al., 2018 [19]
<b>Study Design</b>	Pilot study	Pilot RCT	Prospective RCT
<b>Study Participants</b>			
Sample Size	Total 15 participants (9 females, 6 males)	Total 30 participants (17 females, 13 males)	Total 54 participants (17 females, 37 males)
Age in years (SD)	Mean age 15.0 (1.69) Range = 10-17	Range = 12-17	Mean age BCTT = 15.19 (1.45) Mean age control = 15.63 (1.36) Range = 14-19
Athlete (Y/N)	Yes	Mixed (26 athletes, 4 non-athletes)	Yes
<b>Mechanism of Injury</b>	SRC (n = 16) MVA (n = 2)	SRC (n = 18) Other (n = 12)	SRC
<b>Time between injury and recruitment (SD)</b>	>4 weeks post injury Mean = 49d (17)	4-16 weeks persistent symptoms EXG mean = 52.3d (19.93) Stretching group mean = 55.95d (22.16)	1-10 days post injury Median = 4d
<b>Intervention Investigated</b>	<i>Treatment:</i> Interdisciplinary active rehabilitation intervention performed 3x/week with 3 components; (1) aerobic training (cycling, 3 progressive stages, max 20 min) (2) sport-specific coordination exercises (5-10 min), (3) therapeutic balance exercises 30 sec repetition for 3 exercises).	<i>Treatment:</i> Subsymptom aerobic training performed 5-6 days/week at 80% of the duration that exacerbated symptoms during assessment. Program modified every week. <i>Control:</i> Fully body stretching performed 5-6 days/week. Program rotated on 2-week basis.	<i>Treatment:</i> Performed BCTT on visit day #1 <i>Control:</i> Standard of care (no treadmill test on visit #1). Both groups performed BCTT at 14 days follow-up (clinic visit #2)
<b>Intervention Duration</b>	Mean = 49d (17)	6 weeks	14 days
<b>Symptom Scale</b>	PCS inventory (PCSI)	PCS inventory (PCSI)	PCS scale
<b>Symptom Scores:</b>	<i>Total PCS-scores mean (SD)</i> Pre-intervention = 36.9 (23.2) Post-intervention = 4.3 (5.0)	<i>Total PCS-scores mean (SD)</i> <b>EXG:</b> baseline = 37.40 (25.01), final = 4.17 (7.36) <b>Control:</b> baseline = 40.27 (27.25), final = 15.93 (20.18)	<i>PCS-severity score median (IQR)</i> <b>BCTT:</b> baseline = 31 (33), Day 7 = 7.5 (24.5) <b>Control:</b> baseline = 17 (27), Day 7 = 7.0 (19.0)
<b>Main Findings</b>	The PCSI score decreased significantly after the intervention ( $Z = -3.18, p = .001$ ).	Both groups saw improvement in symptom scores. There was a significant group by time interaction with self-reported PCSI ratings that indicates a greater rate of improvement in the subsymptom aerobic training group compared to control ( $F = 4.11, p = .044$ )	Symptom scores did decrease over time but were not significantly associated with group assignment ( $p = .378$ ). No significant difference in mean time to recovery between groups (BCTT = 27.5d, control = 23.5d) ( $p = .706$ ).

**Table 1 (continued...)**

	<b>Leddy et al., 2013 [20]</b>	<b>Leddy et al., 2019 [40]</b>	<b>Leddy et al., 2019 [41]</b>
<b>Study Design</b>	Pilot study	RCT	Quasi-experimental design
<b>Study Participants</b>			
Sample Size	Total 12 participants (8 females, 4 males)	Total 103 participants (48 females, 55 males)	Total 54 participants (54 males)
Age in years (SD)	Mean age = 24 Range = 18-34	Mean age EXG = 15.3 (1.6) Mean age control = 15.4 (1.7) Range = 13-18	Mean age EXG = 15.13 (1.42) Mean age RG = 15.33 (1.40) Range = 13-18
Athlete (Y/N)	Mixed (ratio 50:50)	Yes	Yes
<b>Mechanism of Injury</b>	N/A	SRC	SRC
<b>Time between injury and recruitment (SD)</b>	EXG mean = 65.25d Stretching mean = 170.75d	Within 10 days of injury EXG mean = 4.9d (2.2) Control mean = 4.8d (2.4)	Within 10 days of injury EXG mean = 4.75d (2.47) RG mean = 4.50d (2.13)
<b>Intervention Investigated</b>	<i>Treatment:</i> Aerobic exercise group. Performed 6 days/week, 20 min/day, at 80% HR attained on treadmill test (Balke treadmill test). <i>Control:</i> Placebo stretching group (PG). Gradually progressing 12-week low-impact breathing and stretching program (20 min/day, 6 days/week, <40-50% age predicted max HR).	<i>Treatment:</i> Progressive subsymptom threshold aerobic exercise performed 20 min/day on stationary bike or treadmill at 80% HR achieved on BCTT. <i>Control:</i> Progressive placebo-like stretching program performed 20 min per day.	<i>Treatment:</i> Subthreshold aerobic exercise performed 20 min/day with 5 min warmup at 80% HR achieved on BCTT. <i>Control:</i> Relative rest prescription (no structured exercise).
<b>Intervention Duration</b>	Approx. 12 weeks	30 days, or until recovered (which ever came first)	14 days
<b>Symptom Scale</b>	PCS scale	PCS scale	PCS scale in SCAT-3
<b>Symptom Scores:</b>	<i>Mean number of PCS</i> <b>EXG:</b> time 1 = 17.5, time 2 = 2 <b>PG:</b> time 1 = 19, time 2 = 15	<i>Mean PCS-score (SD)</i> <b>EXG:</b> Pre-intervention = 30.8 (16.5); Post-intervention = 2.0 (1.5) <b>Control:</b> Pre-intervention = 33.3 (19.7); Post-intervention = 5.5 (5)	<i>Mean PCS-score (SD)</i> <b>EXG:</b> Pre-intervention = 22.79 (13.8); Post-intervention = 1.0 (1.5) <b>RG:</b> Pre-intervention = 28.43 (17.95); Post-intervention = 6.5 (5.5)
<b>Main Findings</b>	The EXG had significantly greater exercise HR ( $p < .001$ ) and fewer PCS ( $p < .0004$ ) than placebo stretching group at follow-up.	EXG recovered significantly faster than stretching group (median 13d vs. 17d, respectively) ( $Z = 2.82$ ; $p = .005$ ). Total symptom scores appeared to decrease more rapidly in the EXG (achieving significance on days 5, 12, and 18). Incidence of delayed recovery (>30d) higher in stretching group ( $n = 7$ ) compared to EXG ( $n = 2$ ) but was not significant ( $P = .08$ ).	Recovery time from initial visit was significantly faster for EXG than RG ( $p = .048$ ) (Cohen $d = 0.5$ favouring EXG). EXG had significantly fewer participants remaining symptomatic (total ( $p = .011$ ), physical ( $p = .028$ ), cognitive ( $p = .027$ ), and sleep symptoms ( $p = .011$ )) on day 14. No EXG participants experienced delayed recovery (>30d) vs. 4/30 (13%) RG.

Table 1 (continued...)

	Leddy et al., 2010 [17]	Maerlender et al., 2015 [47]	McGeown et al., 2018 [45]
<b>Study Design</b>	Prospective case series	Pilot RCT	Pre-test post-test pilot study
<b>Study Participants</b>			
Sample Size	Total 12 participants (5 females, 7 males)	Total 28 participants (20 females, 8 males)	Total 9 participants (5 females, 4 males)
Age in years (SD)	Mean age = 27.9 (14.3) Range = 16-53	N/A	Range = 14-30
Athlete (Y/N)	Mixed (ratio 50:50)	Yes	Yes
<b>Mechanism of Injury</b>	SRC (n = 5) Other; MVA and falls (n = 7)	N/A	SRC (n = 8) MVA (n = 1)
<b>Time between injury and recruitment (SD)</b>	Mean = 19 weeks post injury Range = 6-40 weeks	N/A	> 8 weeks post injury Mean = 99.88d (79.95)
<b>Intervention Investigated</b>	<i>Treatment:</i> Treadmill test to symptom exacerbation threshold (ST) before and after 2-3 weeks of baseline. Subject then instructed to exercise 5-6 days/week at 80% ST HR. Treadmill testing repeated every 3 weeks until voluntary peak exertion without exacerbation of symptoms.	<i>Treatment:</i> Aerobic exercise intervention. Participants rode stationary bike at perceived exertion level of “mild” to “moderate” (0-6 on Borg RPE scale) for 20 min. Actigraph placed on each participant to measure ambient activity levels. <i>Control:</i> Standard of care. Instructed to not engage in any systematic exertion beyond the normal activities required for school (e.g. walking to classes)	<i>Treatment:</i> Structured exercise-based rehabilitation program consisting of warm up (5 min), stationary cycling, static balance training and cool down for 40-60 min each session. Sessions were done at target HR (calculated using Karvonen formula) 3 times a week for a total of 12 sessions.
<b>Intervention Duration</b>	3 months	N/A	~4 weeks Mean = 36.78d ( $\pm$ 11.85)
<b>Symptom Scale</b>	Graded symptom checklist	ImpACT PCS scale	ImpACT PCS scale
<b>Symptom Scores: mean (SD)</b>	<i>Mean PCS-scores (SD)</i> Pre-intervention: 9.67 (5.87) Post-intervention: 5.42 (4.54)	<i>Change in total PCS-scores, mean (SD)</i> EXG = -2.29 (2.04) control = -2.07 (2.35)	<i>Total PCS-scores, mean (SD)</i> Pre-intervention = 33.11 (23.17) Post-intervention = 18.0 (30.09)
<b>Main Findings</b>	No adverse events were reported. Time series analysis showed significant change in rate of symptom reduction for all subjects and reduced mean symptom number in 8/11 participants. Rate of symptom improvement was directly related to exercise intensity achieved (peak exercise HR) ( $r = -0.55, p = .04$ ). Athletes recovered faster than non-athletes ( $25 \pm 8.7$ vs. $74.8 \pm 27.2$ days, $p = .01$ ).	No significant difference in days to recover between groups (EXG median = 15d; control median = 13 days) or total symptom change scores ( $p > .10$ ). Moderate physical activity did not have significant effect on time to recovery. Though there was significant variance in recovery time with more time in vigorous activity increasing recovery time ( $R^2 = .18, p = .039$ ).	Significant reduction in PCS scores following treatment ( $p = .01$ ). Provides preliminary evidence that exercise-based treatments may improve PCS outcomes.

**Table 1 (continued...)**

	<b>Micay et al., 2018 [37]</b>	<b>Thastum et al., 2019 [46]</b>	<b>Willer et al., 2019 [42]</b>
<b>Study Design</b>	RCT	RCT	Quasi-experimental trial
<b>Study Participants</b>			
Sample Size	Total 15 participants (0 females, 15 males)	Total 112 participants (89 females, 23 males)	Total 151 participants (60 females, 91 males)
Age in years (SD)	Mean age EXG = 15.8 (1.2) Mean age UCG = 15.6 (1.0) Range = 14-18	Mean age GAIN = 22.9 (4.2) Mean age EUC = 22.9 (4.3) Range = 15-30	Mean age EXG = 15.3 (1.6) Mean age Placebo = 15.4 (1.7) Mean age RG = 15.4 (1.4) Range = 13-18
Athlete (Y/N)	Yes	N/A	Yes
<b>Mechanism of Injury</b>	SRC	Traffic accident (n = 32) Fall (n = 26) Direct blow to head (n = 23) SRC (n = 27)	SRC
<b>Time between injury and recruitment (SD)</b>	6 days post injury	Within 2-6 months post injury Median = 3.8 months	Within 10 days post injury
<b>Intervention Investigated</b>	<i>Treatment:</i> Standardized aerobic exercise intervention consisting of 8 sessions with progressive increase in intensity and duration on cycle ergometer. Performed for max 20 min with 5 min warm up and cool-down at max 70% of individual's age-predicted max HR. Sessions performed on two consecutive days with 1-day rest for total 11 days. <i>Control:</i> UCG directed through existing 6-stage progression of activity consistent with Berlin 2016 guidelines	<i>Treatment:</i> EUC + GAIN protocol. EUC consists of individualized psychoeducation (30min). GAIN is based on gradual return to activities, consisting of 3 structured group sessions and 5 semi-structured individual sessions. Told to gradually increase duration and intensity of activities that provoked symptoms. <i>Control:</i> EUC consisting of individualized psychoeducation (30 min)	<i>Treatment:</i> EXG was prescribed aerobic exercise at 80% of HR achieved at symptom exacerbation on BCTT for 20 min/day with 5 min warmup and 5 min cool down. <i>Control:</i> PG prescribed progressive stretching program (breathing exercises and whole body stretches) performed for 20 min/day. <i>Control:</i> Rest group was prescribed relative rest (no sports or other forms of exercise) according to previous standard of care.
<b>Intervention Duration</b>	11 days	8 weeks	N/A
<b>Symptom Scale</b>	PCS scale in SCAT-3	Rivermead PCS questionnaire	PCS scale in SCAT-3
<b>Symptom Scores</b>	<i>Mean PCS-scores (SD)</i> <b>EXG:</b> Pre-intervention = 32 (13); Post-intervention = 4.12 (3.73). <b>UCG:</b> Pre-intervention = 24.4 (18.7); Post-intervention = 9 (2)	<i>Change in RPQ total</i> GAIN+EUC = -17.4 EUC = -9.9	<i>Mean PCS-scores (SD)</i> <b>Baseline:</b> EXG = 30.8 (16.5); PG = 33.3 (19.7); RG = 31.8 (18.9) <b>Follow-up:</b> EXG = 3.2 (2.4); PG = 7.2 (4.0); RG = 6.8 (4.8)
<b>Main Findings</b>	No significant difference between groups in average time to medical clearance (EXG mean = 36.1 ± 18.5d, UCG mean = 29.6 ± 15.8) ( $p = .87$ ; Cohen $d = 0.4$ ). EXG experienced greater symptom resolution compared with UCG across recovery timeline; particularly between weeks 1-3 and weeks 1-4	Participants allocated to EUC+GAIN reported significantly larger reduction in PCS than participants allocated to EUC, with a mean adjusted difference in improvement of 7.6 points ( $p = .008$ ).	Median recovery time was significantly lower in EXG (13d) compared to RG (16d) and PG (17d) ( $p = .020$ ). Four percent of the EXG, 14% of the PG, and 13% of RG participants had delayed recovery ( $p = .190$ ). Male and female participants did not differ in recovery time or delayed recovery across groups.

Abbreviations: *BCTT*, Buffalo Concussion Treadmill Test; *BESS*, balance error scoring system; *BP*, blood pressure; *EXG*, exercise group; *EUC*, enhanced usual care; *GAIN*, "get going after concussion"; *GXT*, graded exercise test; *HR*, heart rate; *ImPACT*, immediate post-concussion assessment and cognitive testing; *IQR*, interquartile range; *MVA*, motor vehicle accident; *N/A*, not applicable; *OT*, occupational therapist; *PCS*, post-concussion symptom; *PG*, placebo group; *QOL*, quality of life; *RCT*, randomized controlled trial; *RPE*; rating of perceived exertion; *RTP*; return to play; *RPQ*, Rivermead post-concussion symptom questionnaire; *SCAT*, Sports Concussion Assessment Tool; *SD*, standard deviation; *SRC*, sports related concussion; *UCG*, usual care group; *wk.*, week

\* Data is presented as provided in original articles