Supplemental Table S1: Normality assessment and inferential analyses of BL2 - BL1 difference scores.

Cohort	N	Shapiro-Wilk *W*	Shapiro-Wilk *p*	Paired *p*	Wilcoxon *p*	Holm-adjusted *p*
Roller Derby 2023	80	0.958	0.011	<0.001	<0.001	<0.001
Roller Derby 2024	47	0.855	<0.001	0.001	<0.001	0.003
Roller Derby 2025	49	0.952	0.046	<0.001	<0.001	0.001
Roller Derby 2026	49	0.932	0.008	0.042	0.020	0.042
Roller Derby TOTAL†	225	0.950	<0.001	<0.001	<0.001	-
Rugby League 2023	62	0.918	<0.001	0.001	<0.001	0.006
Rugby League 2024	31	0.864	0.418	0.009	0.014	0.018
Rugby League 2025	36	0.861	<0.001	0.005	0.012	0.014
Rugby League 2026	34	0.934	0.002	0.001	0.002	0.003
Rugby League TOTAL†	163	0.921	<0.001	<0.001	<0.001	-
Both Sports Combined†	388	0.940	<0.001	<0.001	<0.001	-

†=Pooled aggregate, not an independent sample; Shapiro-Wilk *W* and *p* refer to the distribution of the paired differences (BL2 - BL1). Paired *t* p = two-sided paired-samples *t*-test; Wilcoxon *p* = two-sided Wilcoxon signed-rank test. Holm-adjusted *p* = Holm-Bonferroni-corrected *p*-value of the paired *t*-test across the eight independent yearly cohorts (family n = 8).

Supplemental Table S2: Heterogeneity and random-effects sensitivity analyses of pooled reliability and practice-effect estimates.

Grouping	Metric	n=	*Q* (df)	Raw *p*	I^2 (95% CI]	τ^2	Naive pooled	RE-pooled (95% CI]
Roller Derby	ICC	4	6.54 (3)	0.088	54.1% (0.0 - 84.8)	0.023	0.832	0.836 (0.765 to 0.887)
Rugby League	ICC	4	20.29 (3)	<0.001	85.2% (63.4 - 94.0)	0.158	0.822	0.857 (0.695 to 0.936)
All 8 cohorts	ICC	8	26.86 (7)	<0.001	73.9% (47.1 - 87.2)	0.063	0.830	0.846 (0.776 to 0.895)
Roller Derby	Practice effects	4	2.59 (3)	0.459	0.0% (0.0 - 82.3)	0.000	-2.577	-2.565 (-3.236 to -1.893)
Rugby League	Practice effects	4	4.13 (3)	0.248	27.3% (0.0 - 72.8)	0.183	-2.437	-2.180 (-2.977 to -1.383)
All 8 cohorts	Practice effects	8	7.72 (7)	0.358	9.3% (0.0 - 70.6)	0.048	-2.518	-2.337 (-2.833 to -1.841)

n = number of yearly cohorts pooled; ICC estimates were pooled using Fisher z-transformation and practice-effect estimates using inverse-variance weighting of cohort mean differences; *Q* = Cochran's heterogeneity statistic; I^2 = percentage of total variability attributable to between-cohort heterogeneity (95% CI estimated using the *H*-statistic[56]); τ^2 = estimated between-cohort variance; Naive pooled = primary pooled estimate derived from the aggregated sample; RE-pooled = DerSimonian-Laird random-effects pooled estimate.

Supplemental Table S3: Between-sport comparison of BL1, BL2, and representative Baseline (BL) scores by year.

		WFTRD		WRL				
Year	**Metric**	**n=**	**Mean (SD)**	**n=**	**Mean (SD)**	***t*** **(df)**	**Raw *p***	**Holm-corrected *p***
2023	BL1	80	54.00 (9.31)	62	51.32 (8.98)	1.743 (133.5)	0.084	0.335
2023	BL2	80	51.00 (8.56)	62	48.62 (8.61)	1.636 (130.9)	0.104	0.313
2023	BL	80	50.19 (8.63)	62	47.82 (8.51)	1.633 (132.1)	0.105	0.314
2024	BL1	47	53.35 (11.96)	31	52.94 (10.45)	0.159 (70.1)	0.874	0.874
2024	BL2	47	50.82 (10.81)	31	51.55 (10.03)	-0.306 (67.7)	0.760	0.760
2024	BL	47	50.28 (10.82)	31	50.93 (10.07)	-0.272 (67.5)	0.786	0.786
2025	BL1	49	53.64 (10.79)	36	50.39 (9.76)	1.449 (79.4)	0.151	0.454
2025	BL2	49	50.70 (10.22)	36	48.08 (9.41)	1.223 (78.8)	0.225	0.450
2025	BL	49	49.99 (10.04)	36	47.63 (9.16)	1.127 (79.1)	0.263	0.527
2026	BL1	49	50.73 (9.60)	34	47.93 (8.73)	1.376 (75.2)	0.173	0.454
2026	BL2	49	49.17 (8.01)	34	44.88 (7.91)	2.415 (71.7)	0.018	0.073
2026	BL	49	48.12 (7.57)	34	44.54 (7.73)	2.089 (70.2)	0.040	0.161

WFTRD = Women's Flat Track Roller Derby; WRL = Women's Rugby League; BL = representative Baseline (faster of BL1/BL2). Welch's *t*-test (unequal variance) used throughout; Holm-Bonferroni correction applied within each metric's family of four yearly comparisons.

Supplemental Table S4: Brain Injury Screening Tool (BIST) symptoms and reasons for review in concussed athletes, by sport.

	All (n=52)	WFTRD (n=23)	WRL (n=29)	Raw *p*	Holm *p*
Symptom burden and review (mean ±SD)					
Number of BIST symptoms endorsed (of 12)	5.2 ±2.0	4.5 ±1.9	5.8 ±2.0	*0.0126*	*0.0379*
Total BIST symptom severity (sum of item scores)	13.2 ±3.5	12.7 ±2.9	13.6 ±4.0	0.3089	0.4835
Number of reasons for review	2.9 ±1.0	2.7 ±1.1	3.0 ±1.0	0.2418	0.4835
BIST symptom domain and item, endorsed (score >0), n (%)					
Physical	**47 (90.4)**	**19 (82.6)**	**28 (96.6)**	**0.1574**	**0.3149**
Headache	40 (76.9)	16 (69.6)	24 (82.8)	0.3290	1.0000
Neck hurts	32 (61.5)	10 (43.5)	22 (75.9)	*0.0233*	0.2800
Bright lights	22 (42.3)	8 (34.8)	14 (48.3)	0.4026	1.0000
Loud noises	15 (28.8)	6 (26.1)	9 (31.0)	0.7652	1.0000
Vestibular-ocular	**40 (76.9)**	**14 (60.9)**	**26 (89.7)**	**0.0210**	**0.0631**
Feel dizzy	25 (48.1)	9 (39.1)	16 (55.2)	0.2781	1.0000
Loss of balance	28 (53.8)	8 (34.8)	20 (69.0)	*0.0244*	0.2800
Vision problems	7 (13.5)	1 (4.3)	6 (20.7)	0.1170	1.0000
Clumsy	18 (34.6)	8 (34.8)	10 (34.5)	1.0000	1.0000
Cognitive	**50 (96.2)**	**23 (100.0)**	**27 (93.1)**	**0.4970**	**0.4970**
Difficulty thinking	17 (32.7)	7 (30.4)	10 (34.5)	1.0000	1.0000
Forgetfulness	14 (26.9)	6 (26.1)	8 (27.6)	1.0000	1.0000
Confused	27 (51.9)	12 (52.2)	15 (51.7)	1.0000	1.0000
Difficulty concentrating	27 (51.9)	12 (52.2)	15 (51.7)	1.0000	1.0000
Reason for review, n (%)					
1. Unprotected fall (no protective action; stiff or limp)	7 (13.5)	2 (8.7)	5 (17.2)	0.4437	1.0000
2. Lying motionless or unresponsive	4 (7.7)	1 (4.3)	3 (10.3)	0.6206	1.0000
3. Balance difficulties, stumbling or incoordination	22 (42.3)	8 (34.8)	14 (48.3)	0.4026	1.0000
4. Blank stare or vacant look	14 (26.9)	5 (21.7)	9 (31.0)	0.5388	1.0000
5. Slow to get up	22 (42.3)	10 (43.5)	12 (41.4)	1.0000	1.0000
6. Holding or shaking head	22 (42.3)	10 (43.5)	12 (41.4)	1.0000	1.0000
7. Other	2 (3.8)	2 (8.7)	0 (0.0)	0.1908	1.0000
8. Visible facial or head trauma	8 (15.4)	5 (21.7)	3 (10.3)	0.4411	1.0000
9. Uncharacteristically withdrawn, aggressive or emotional	3 (5.8)	1 (4.3)	2 (6.9)	1.0000	1.0000
10. Moving away from or being unengaged with the competition	0 (0.0)	0 (0.0)	0 (0.0)	1.0000	1.0000
11. Significant collision or hit regardless of signs or symptoms	21 (40.4)	9 (39.1)	12 (41.4)	1.0000	1.0000
12. Concern expressed by a teammate, coach, parent or referee/official	25 (48.1)	9 (39.1)	16 (55.2)	0.2781	1.0000

WFTRD = women's flat-track roller derby; WRL = women's rugby league; BIST = Brain Injury Screening Tool; BIST items were rated 0 (none) to 10 (severe); total severity is the sum of the 12 item scores; Reasons for review are observed signs recorded for each athlete, and more than one could be recorded.

Supplementary Table S5: Sensitivity analyses of exploratory KDT discrimination under alternative change-score definitions addressing the practice-effect asymmetry between concussed and comparator observations.

Analysis	Concussed change score (n=52)	Comparator change score (n=336)	AUC (95% CI)	ΔAUC vs primary (*p*=)	Sensitivity at primary threshold	Specificity at primary threshold	Re-derived Youden threshold (Se / Sp)
Primary	PC - representative baseline	BL2 - BL1	0.917 (0.883-0.942)	-	92.3% (81.8-97.0)	82.1% (77.7-85.9)	≥0.92 s (92.3% / 82.1%)
S1: preceding-trial reference	PC - BL2	BL2 - BL1	0.890 (0.850-0.930)	-0.027 (0.024)	84.6% (72.5-92.0)	82.1% (77.7-85.9)	≥0.99 s (84.6% / 82.1%)
S2: first-trial reference	PC - BL1	BL2 - BL1	0.740 (0.656-0.823)	-0.177 (<0.001)	61.5% (48.0-73.5)	82.1% (77.7-85.9)	≥-0.11 s (75.0% / 68.8%)
S3: practice-corrected comparator	PC - representative baseline	(BL2 - BL1) + 2.52 s	0.787 (0.729-0.844)	-0.130 (<0.001)	92.3% (81.8-97.0)	54.2% (48.8-59.4)	≥0.92 s (92.3% / 54.2%)

AUC = area under the receiver operating characteristic curve; BL1, BL2 = first and second same-day baseline trials; PC = post-concussion KDT time; representative baseline = faster of BL1 and BL2. Positive change scores indicate slower (worse) performance. S3 removes the combined-sample mean practice effect (-2.52 s) from each comparator change score. AUC 95% CIs and ΔAUC p-values were estimated using the DeLong method for correlated ROC curves; sensitivity and specificity 95% CIs use the Wilson score method. The primary threshold is the primary Youden-optimal threshold (worsening ≥0.92 s, reported as ≥0.93 s in the manuscript). Within sport, S1 AUCs were 0.915 (95% CI 0.868-0.963) in roller derby and 0.869 (0.805-0.934) in rugby league (primary: 0.934 and 0.904).