

Table S1. Characteristics for the sport-related concussion (SRC), repetitive head impact exposure (RHI), and non-contact normal control (NC) groups at four timepoints, including 24-48 hours post-injury, at the time of initial asymptomatic recovery, 7 days after unrestricted return-to-play (RTP), and 6 months after injury.

	SRC	RHI	NC	p value
24-48 hours post-injury				
N	24	26	28	
Age, mean \pm SD, year	19.7 \pm 1.1	19.3 \pm 1.2	19.7 \pm 1.4	
SCAT3 total symptom score	29.7 \pm 18.1	1.9 \pm 3.3	2.1 \pm 2.5	< 0.0001
Asymptomatic state	8.1 \pm 5.6 days since injury [2 – 21 days]			
N	20	25	26	
Age, mean \pm SD, year	19.6 \pm 1.1	19.3 \pm 1.2	19.7 \pm 1.4	
SCAT3 total symptom score	1.5 \pm 2.3	0.7 \pm 1.1	1.2 \pm 2.0	0.454
RTP state	27 \pm 12.5 days since injury [14 – 52 days]			
N	10	25	26	
Age, mean \pm SD, year	19.6 \pm 1.3	19.3 \pm 1.2	19.7 \pm 1.4	
SCAT3 total symptom score	0	1.1 \pm 2.1	1.4 \pm 3.8	0.418
6 months	182 \pm 14 days since injury [147 – 197 days]			
N	12	18	17	
Age, mean \pm SD, year	19.3 \pm 1.1	19.1 \pm 0.9	19.8 \pm 1.4	
SCAT3 total symptom score	1.3 \pm 2.6	1.5 \pm 4.5	0.7 \pm 1.2	0.745

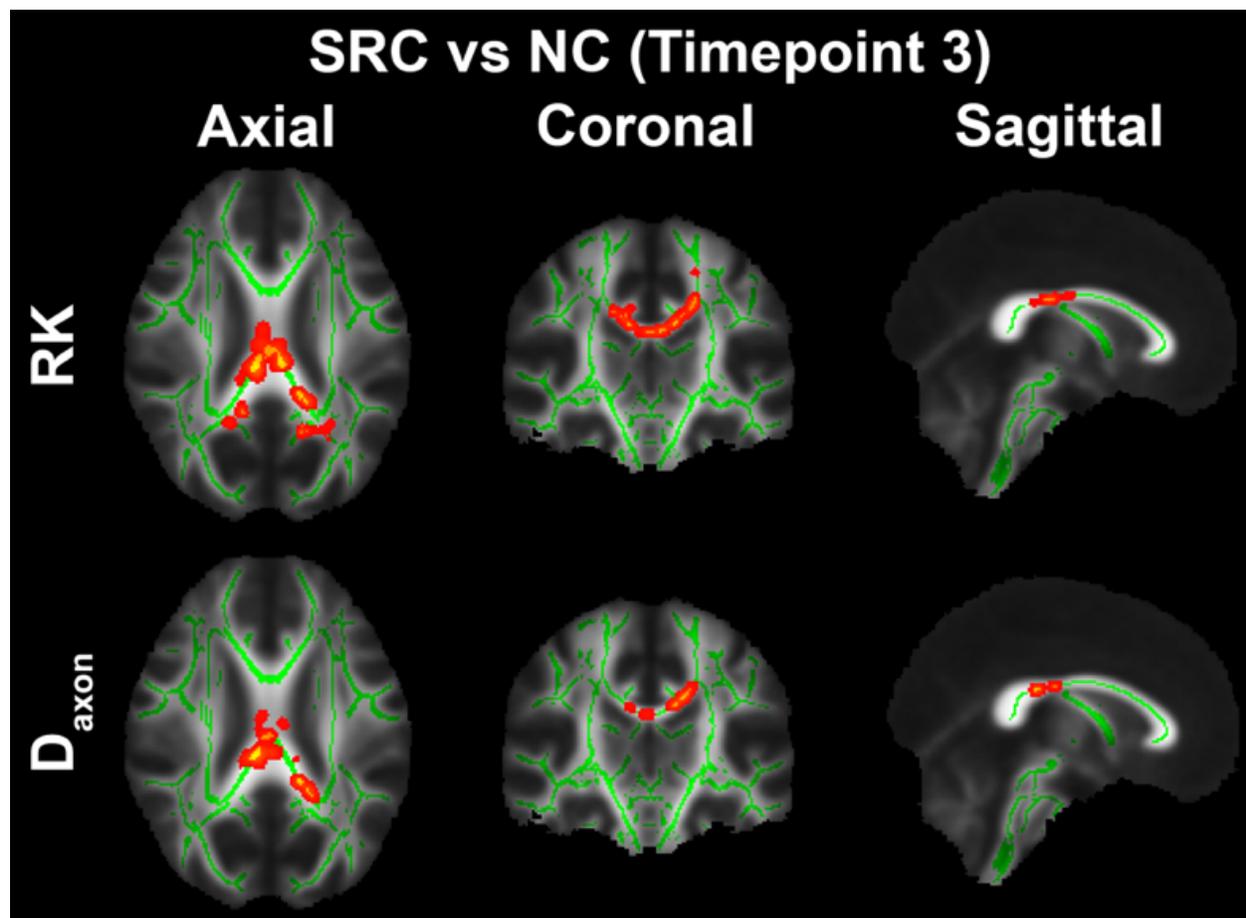


Figure S1. TBSS results comparing SRC and NC groups at timepoint 3 (unrestricted return-to-play): Clusters of voxels (red) with significantly lower RK and D_{axon} in the SRC group compared with the NC group are present primarily in the posterior callosum.

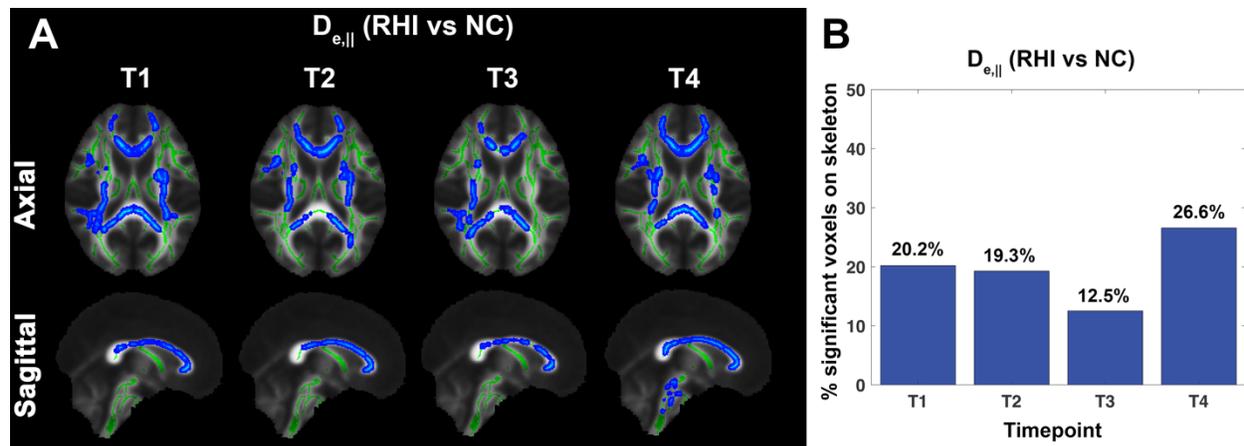


Figure S2. Longitudinal changes between the RHI and NC groups. (A) Maps of voxels (blue) demonstrating significantly increased $D_{e,||}$ are shown across four timepoints (T1-T4). (B) Corresponding bar graphs show the percentage of significantly different voxels on the skeleton across timepoints. Briefly, the persistent extent of differences in $D_{e,||}$ is seen mainly within the corpus callosum and posterior limb of internal capsule across timepoints.