



Sports-Related Concussion in Helmeted vs. Unhelmeted Athletes: Who Fares Worse?

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Introduction

Sports-related concussion (SRC) has emerged as an international public health dilemma. Little is known about the effect of wearing or not wearing a helmet (i.e., helmet status) on the acute outcomes of concussed athletes. We endeavored to assess acute neurocognitive and symptom changes after SRC in helmeted vs. unhelmeted athletes. We were not assessing helmet use on concussion prevention; rather, we attempted to address the question of once the concussion has occurred in a helmeted vs. non-helmeted athletes, are the clinical outcomes the same?

Learning Objectives

To assess acute post-concussion outcomes in helmeted vs. unhelmeted athletes.

To determine if helmet status portends a better or worse prognosis in the acute

Methods

In a retrospective study, 1,025 athletes from two regional databases with SRC were evaluated. 235 athletes were excluded, and the remaining 790 were grouped according to helmet status and matched by age, gender, number of prior concussions, and days to post-concussion test, yielding a final cohort of 138 athletes. For each group of 69, differences in post-concussion neurocognitive and total symptom scores were compared using group mean differences as well as reliable change index (RCI) scores set at the 80% confidence interval. All scores were compared with either student's t-test or Mann-Whitney U test. Statistical significance was set at an alpha of 0.05.

Table 1. Demographic characteristics of participants (n=138).				
Characteristic	Helmeted Sports (n=69)	Non-Helmeted Sports (n=69)		p
Age, median (95% CI)	16 (15-16)	16 (15-17)		0.722
Male gender, (n, %)	67 (97.1%)	67 (97.1%)		>0.999
Handedness				
Right handedness (n, %)	65 (95.6%)	60 (90.9%)		
Ambidexterity (n, %)	2 (2.9%)	2 (3.0%)		0.373
Height, mean (SD)	178.4 cm (8.5)	176.4 cm (13.0 cm)		0.392
Weight, median (95% CI)	76.1 kg (70.5-79.6)	68.2 kg (65.9-70.5)		0.003
Body mass index, median (95% CI)	23.7 (21.7-24.9)	21.5 (20.4-22.2)		0.001
# years of education, median (95% CI)	10 (9-10)	10 (9-10)		0.898
Type of school, n (%)				
Middle School	2 (2.9%)	4 (5.8%)		
High School	61 (88.4%)	58 (84.1%)		
College	6 (8.7%)	7 (10.1%)		0.664
# prior concussions, median (95% CI)	0 (0-0)	0 (0-1)		0.628
Days to post concussion test, median (95% CI)	3 (2-4)	3 (2-4)		0.906
Baseline Impulse Control, median (95% CI)	6 (5-8)	7 (5-8)		0.771
Postconcussion Impulse Control, median (95% CI)	6 (5-9)	6 (5-8)		0.623
Type of sport, n (%)				
Football*	61 (88.4%)	0 (0.0%)		
Lacrosse*	3 (4.3%)	0 (0.0%)		
Ice Hockey*	5 (7.2%)	0 (0.0%)		
Soccer	0 (0.0%)	35 (50.7%)		
Wrestling	0 (0.0%)	13 (18.9%)		
Basketball	0 (0.0%)	17 (24.6%)		
Other	0 (0.0%)	4 (5.8%)		<0.001

*These were the three helmeted sports. We defined a helmet as a protective device covering the frontal, parietal, temporal, and occipital regions of the skull.

Results

By design, gender, number of prior concussions, and days to post-concussion test were identical in both groups, with age nearly identical. The only between group differences in demographic variables were higher weight and BMI in the helmeted group. Using group mean change scores and RCI methodology, we found no significant differences between the helmeted and unhelmeted groups in four neurocognitive tests and one aggregate symptom score.

Table 2. Neurocognitive Scores and TSS at Baseline and Post-Concussion Testing.			
Neurocognitive Score	Helmet Status (n=138)		
	Helmeted (n=69)	Unhelmeted (n=69)	p*
Baseline			
Verbal Memory	83.0 (10.3)	81.5 (11.9)	0.567
Visual Memory	71.4 (12.6)	70.5 (15.0)	0.708
Visual Motor Speed	37.2 (6.4)	38.7 (7.4)	0.197
Reaction Time	0.59 (0.11)	0.60 (0.14)	0.743
TSS	6.3 (10.0)	10.4 (16.4)	0.093
Post-Concussion			
Verbal Memory	77.9 (14.3)	77.8 (13.9)	0.992
Visual Memory	64.9 (14.4)	66.5 (15.2)	0.418
Visual Motor Speed	34.9 (8.4)	37.2 (8.6)	0.130
Reaction Time	0.64 (0.15)	0.62 (0.13)	0.724
TSS	15.7 (14.9)	16.6 (17.4)	0.821



Table 3. Mean Change of Neurocognitive Scores and TSS from baseline.			
Neurocognitive Score	Helmet Comparison (n=138)		
	Helmeted (n=69)	Unhelmeted (n=69)	p*
Verbal Memory	-5.1 (14.3)	-3.7 (10.4)	0.820
Visual Memory	-6.5 (14.5)	-4.0 (13.4)	0.057
Visual Motor Speed	-2.3 (7.1)	-1.5 (5.8)	0.959
Reaction Time	0.05 (0.14)	0.02 (0.11)	0.722
TSS	9.4 (13.3)	6.2 (13.1)	0.136

Table 4. Number of patients experiencing a change from baseline according to RCI 80% confidence interval.			
RCI Change from Baseline, 80% CI	Helmet Comparison (n=138)		
	Helmeted (n=69)	Unhelmeted (n=69)	p*
Verbal Memory	22 (31.9%)	21 (30.4%)	>0.999
Visual Memory	20 (29.0%)	13 (18.8%)	0.231
Visual Motor Speed	15 (23.2%)	12 (17.4%)	0.526
Reaction Time	21 (30.4%)	11 (15.9%)	0.068
TSS	23 (33.3%)	20 (29.0%)	0.713



Conclusions

In our cohort of carefully matched athletes from two regional concussion centers, helmet status was unrelated to neurocognitive scores and total symptoms in athletes after suffering a SRC. These findings suggest that the concussion syndrome and acute outcome in helmeted and unhelmeted sports are quite similar.

