



Physical Activity Predicts Kinesiophobia at Return to Play for Athletes with Persistent Post-Concussion Symptoms

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Background

Physical activity (PA) may improve concussion recovery time.

Fear of pain with movement (kinesiophobia) may limit PA.

Individuals with persistent post-concussion symptoms (PPCS, symptoms \geq 28 days) may require a different treatment approach.

Purpose: To examine the relationship between PA and kinesiophobia among athletes with and without persistent post-concussion symptoms (PPCS).

Methods

Athletes ages 10-18 years were evaluated within 14 days of concussion.

Participants rated kinesiophobia using **Tampa Scale of Kinesiophobia (TSK)** at:

- Initial evaluation
- Return to play (RTP) clearance

Participants wore activity monitors to quantify PA between initial and RTP visits:

- Daily step count
- Exercise frequency
- Exercise duration

Grouping variable:

- PPCS: symptoms \geq 28 days
- No PPCS: symptoms < 28 days

Statistical Analysis

Primary outcome: TSK score change from initial evaluation to RTP.

We calculated correlation coefficients between TSK change and each activity variable

- Pearson r for normal distribution
- Spearman rho for non-normal distribution

Participants were analyzed separately based on PPCS or no PPCS

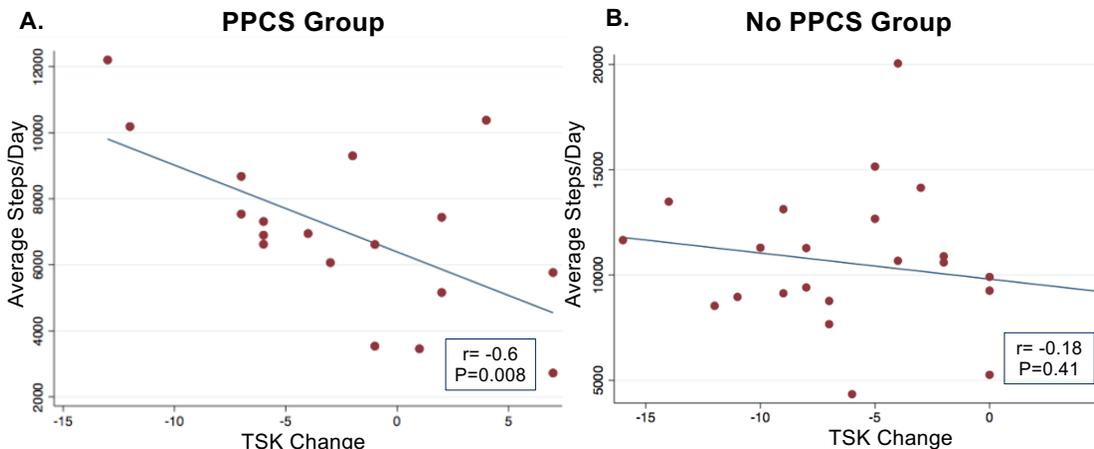


Figure 1: Scatterplot and line of best fit demonstrating correlation between daily step count and TSK change from initial evaluation to RTP clearance visits for: (A) PPCS group, and (B) no PPCS group.

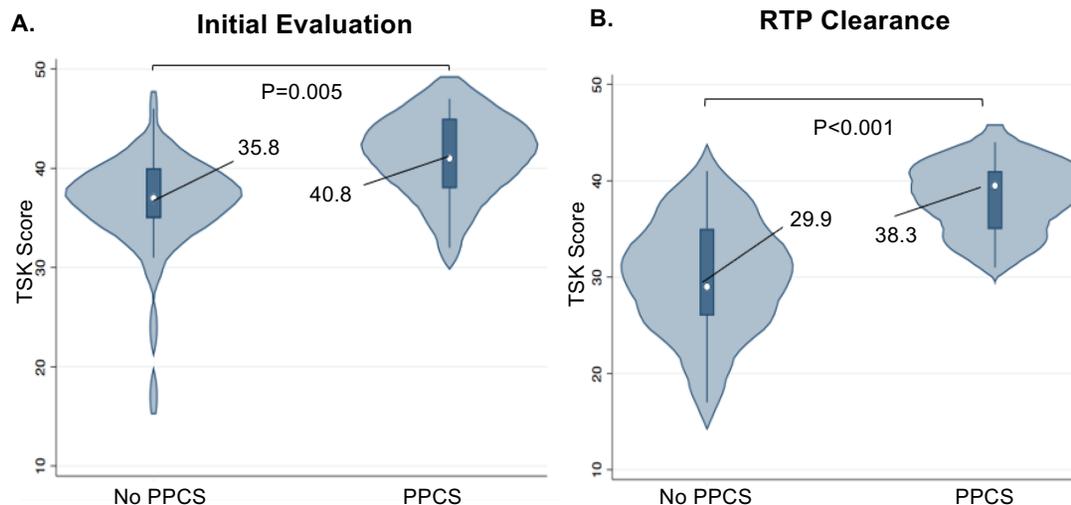


Figure 2: Violin plot describing the distribution of TSK scores for those in the no PPCS and PPCS groups at: (A) initial evaluation, and (B) RTP clearance. The shaded area represents the probability density of data at each outcome measurement, smoothed using a kernel density estimator.

Table 1.	PPCS (n=18)	No PPCS (n=23)	P-value
Sex (female)	9 (50%)	11 (48%)	0.89
Age (years)	14.5 (2.0)	14.9 (1.8)	0.54
Symptom resolution (days)	57.3 (23.9)	15.2 (7.1)	<0.001
RTP clearance (days)	66.8 (25.6)	21.7 (9.1)	<0.001

Results

PPCS Group

- Significant and moderate correlations between TSK change and step count ($r = -0.6$, $p = 0.008$) and exercise frequency ($r = -0.63$, $p = 0.005$)
- Non-significant and weak correlations between TSK change and exercise duration ($\rho = -0.12$, $p = 0.65$)

No PPCS Group

- Non-significant and weak correlations between TSK change and step count ($r = -0.18$, $p = 0.41$), frequency ($r = -0.34$, $p = 0.12$), and duration ($\rho = 0.10$, $p = 0.67$)

Conclusions

Regular PA during concussion recovery, regardless of intensity may help reduce kinesiophobia in those with PPCS.

The PPCS group had higher TSK scores at initial and RTP visits.

- Those with PPCS may be particularly vulnerable to kinesiophobia.
- PA appears to have a beneficial effect for kinesiophobia reduction among those with PPCS.

Acknowledgement

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