Package 'PPCSexRx'

June 15, 2026

Type Package

Title Prescribe Sub-Symptom Exercise for Adolescent Concussion

Version 0.1.1

Description A clinical decision support system for sub-symptom threshold aerobic exercise (SSTAE) prescription in adolescents with persistent post-concussion symptoms (PPCS). Implements an evidence-based protocol derived from a systematic review of seven studies (Li, 2026; <doi:10.17605/osf.io/kvuf6>), encoding safety screening, Buffalo Concussion Treadmill Test (BCTT)-guided heart rate prescription, session-level progress tracking, and evidence disclosure using the Grading of Recommendations, Assessment, Development and Evaluation (GRADE) framework into an open-source tool for athletic trainers and clinicians. Designed to support implementation in resource-limited settings where BCTT equipment may be unavailable. GRADE certainty of evidence: LOW. For clinician use only; not a substitute for clinical judgement.

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Encoding UTF-8

RoxygenNote 8.0.0

Imports graphics, utils

Suggests knitr, rmarkdown, testthat (>= 3.0.0)

VignetteBuilder knitr

URL https://github.com/guangl10/PPCSexRx, https://guanglab.org

BugReports https://github.com/guangl10/PPCSexRx/issues

NeedsCompilation no

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Repository CRAN

Date/Publication 2026-06-15 07:50:31 UTC

Contents

`plot.ppcs_track` *Plot rehabilitation progress for a ppcs_track object*

Description

Generates a dual-panel plot showing PCSS symptom trajectory and achieved HR over time. Requires base R graphics only (no dependencies).

Usage

```
## S3 method for class 'ppcs_track'
plot(x, ...)
```

Arguments

`x`	A ppcs_track object.
`...`	Further arguments passed to `plot()`.

Value

Invisibly returns `x`, called for its side effect of drawing a two-panel base-graphics figure: the upper panel shows Post-Concussion Symptom Scale (PCSS) scores across sessions; the lower panel shows achieved and target heart rate (bpm) across sessions. Returns a message (via `message`) and `invisible(x)` without plotting if fewer than two sessions are recorded.

`prescribe_ppcs` *Prescribe Sub-symptom Aerobic Exercise for Adolescent PPCS*

Description

Implements the evidence-based protocol from Li (2026). GRADE: LOW certainty, Conditional recommendation FOR. Run `screen_ppcs` first to confirm eligibility.

Usage

```
prescribe_ppcs(
  age,
  days_post_injury,
  hrst = NULL,
  vestibular_symptoms = FALSE,
  cervical_symptoms = FALSE,
  sessions_completed = 0,
  last_session_worse = FALSE
)
```

Arguments

`age`	Numeric. Age 13-18 years. CAT p.2, L10: inclusion 13-18.
`days_post_injury`	Numeric. Days since injury. Must be >=28 for PPCS. CAT p.2, L10.
`hrst`	Numeric or NULL. Symptom threshold HR from BCTT (bpm). If NULL, age-predicted fallback is used. CAT p.11, L19.
`vestibular_symptoms`	Logical. TRUE = contraindication. CAT p.11, L25.
`cervical_symptoms`	Logical. TRUE = contraindication. CAT p.11, L25.
`sessions_completed`	Integer. Sessions at current HR without worsening. CAT p.11, L21.
`last_session_worse`	Logical. Did PCSS increase >=2 points last session? CAT p.11, L21-22.

Value

An object of class `ppcs_prescription` with prescription details.

References

Li G. (2026). Sub-symptom Threshold Aerobic Exercise for Adolescents With PPCS: A Critically Appraised Topic. Winner, NATA Foundation Student Writing Contest.

Examples

```
# Case 1: Rural clinic, no BCTT available
prescribe_ppcs(age = 16, days_post_injury = 35)

# Case 2: University clinic with BCTT data
prescribe_ppcs(age = 17, days_post_injury = 40, hrst = 160)

# Case 3: Safety stop - vestibular symptoms present
try(prescribe_ppcs(age = 15, days_post_injury = 30,
                   vestibular_symptoms = TRUE))
```

---

print.ppcs_prescription *Print method for ppcs_prescription objects*

Description

Displays a formatted clinical prescription sheet.

Usage

```
## S3 method for class 'ppcs_prescription'
print(x, ...)
```

Arguments

x	A ppcs_prescription object.
...	Further arguments passed to or from other methods.

Value

Invisibly returns `x` (a `ppcs_prescription` list), called primarily for its side effect of printing the formatted prescription to the console.

---

print.ppcs_screen *Print method for ppcs_screen objects*

Description

Print method for ppcs_screen objects

Usage

```
## S3 method for class 'ppcs_screen'
print(x, ...)
```

Arguments

x	A ppcs_screen object.
...	Further arguments (unused).

Value

Invisibly returns x (a ppcs_screen list), called primarily for its side effect of printing the eligibility screen result to the console.

---

print.ppcs_track *Print method for ppcs_track objects*

Description

Print method for ppcs_track objects

Usage

```
## S3 method for class 'ppcs_track'
print(x, ...)
```

Arguments

x	A ppcs_track object.
...	Further arguments (unused).

Value

Invisibly returns x (a ppcs_track list), called primarily for its side effect of printing the session progress summary to the console.

---

screen_ppcs *Screen Adolescent for SSTAE Eligibility*

Description

Implements the PICO-based eligibility criteria from Li (2026). Run this before prescribe_ppcs to confirm the patient is appropriate for sub-symptom threshold aerobic exercise.

Usage

```
screen_ppcs(
  age,
  days_post_injury,
  vestibular_symptoms = FALSE,
  cervical_symptoms = FALSE,
  vision_symptoms = FALSE,
  verbose = TRUE
)
```

Arguments

`age`	Numeric. Patient age in years. Eligible range: 13-18.
`days_post_injury`	Numeric. Days since concussion. PPCS defined as >=28.
`vestibular_symptoms`	Logical. Active uncontrolled vestibular symptoms? Default FALSE. Contraindication per Li (2026), p.11.
`cervical_symptoms`	Logical. Active uncontrolled cervical symptoms? Default FALSE. Contraindication per Li (2026), p.11.
`vision_symptoms`	Logical. Exercise-induced vision dysfunction present? Default FALSE. Associated with prolonged PPCS (Vernau et al., 2023).
`verbose`	Logical. If TRUE (default), prints full clinical output. Set FALSE for patient/caregiver-facing simplified output.

Value

A list of class `ppcs_screen` with fields:

status "eligible", "contraindicated", or "needs_referral"

reason Character. Clinical rationale for status.

referral Character or NA. Recommended referral if applicable.

next_step Character. Recommended action.

References

Li G. (2026). Sub-symptom Threshold Aerobic Exercise for Adolescents With PPCS: A Critically Appraised Topic. Winner, NATA Foundation Student Writing Contest.

Vernau BT, Haider MN, Fleming A, et al. Exercise-Induced Vision Dysfunction Early After Sport-Related Concussion Is Associated With Persistent Postconcussive Symptoms. Clin J Sport Med. 2023;33(4):388-394.

Examples

```
# Eligible athlete
screen_ppcs(age = 16, days_post_injury = 35)

# Contraindicated: too early
screen_ppcs(age = 16, days_post_injury = 20)

# Needs referral: vestibular symptoms present
screen_ppcs(age = 16, days_post_injury = 35, vestibular_symptoms = TRUE)

# Patient/caregiver output
screen_ppcs(age = 16, days_post_injury = 35, verbose = FALSE)
```

---

track_progress *Track SSTAE Rehabilitation Progress Over Time*

Description

Records and evaluates session-level data over the course of a sub-symptom threshold aerobic exercise programme. Compares observed progress against the progression and stop rules described in Li (2026), p.14, and generates a recommendation for the next session.

Usage

```
track_progress(
  log,
  current_pcss,
  current_hr,
  current_duration,
  prescription,
  verbose = TRUE
)
```

Arguments

log	A data frame of previous sessions with columns: **date** Character or Date. Session date (e.g. "2026-03-01"). **pcss** Numeric. Post-Concussion Symptom Scale total (0-132). **target_hr** Numeric. Prescribed HR target for that session (bpm). **achieved_hr** Numeric. Mean HR achieved during session (bpm). **duration_min** Numeric. Minutes of exercise completed. **symptoms_worsened** Logical. Did PCSS increase >= 2 points vs prior session? Pass NULL to initialise an empty log (first session).
current_pcss	Numeric. Today's PCSS score (0-132).
current_hr	Numeric. HR achieved in today's session (bpm).

`current_duration`
: Numeric. Minutes completed today.

`prescription`
: A `ppcs_prescription` object from `prescribe_ppcs`. Used to retrieve the current target HR.

`verbose`
: Logical. If TRUE (default), prints full clinician output. Set FALSE for patient/caregiver-facing simplified output.

Value

A list of class `ppcs_track` with fields:

updated_log Data frame. The log with today's session appended.

phase Character. Current rehabilitation phase.

recommendation Character. Action for the next session.

adjust_hr Numeric. Suggested HR target for next session (bpm).

sessions_total Integer. Total sessions recorded.

pcss_change Numeric. PCSS change from first to today.

verbose Logical. Passed through for print method.

References

Li G. (2026). Sub-symptom Threshold Aerobic Exercise for Adolescents With PPCS: A Critically Appraised Topic. Winner, NATA Foundation Student Writing Contest. p.14.

Kurowski BG, et al. Aerobic Exercise for Adolescents With Prolonged Symptoms After Mild Traumatic Brain Injury. J Head Trauma Rehabil. 2017;32(2):79-89.

Examples

```
# Step 1: get a prescription
rx <- prescribe_ppcs(age = 16, days_post_injury = 35, hrst = 160)

# Step 2: first session - no prior log
t1 <- track_progress(
  log              = NULL,
  current_pcss     = 28,
  current_hr       = 120,
  current_duration  = 18,
  prescription     = rx
)
t1

# Step 3: second session - pass updated log forward
t2 <- track_progress(
  log              = t1$updated_log,
  current_pcss     = 24,
  current_hr       = 122,
  current_duration  = 20,
  prescription     = rx
)
t2
```

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