{mctq}: An R Package for the Munich ChronoType Questionnaire

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Overview

{mctq} is an R package that provides a complete and consistent toolkit to process the Munich ChronoType Questionnaire (MCTQ), a validated tool to assess chronotypes using peoples' sleep behavior presented by Till Roenneberg, Anna Wirz-Justice, and Martha Merrow in 2003.

The aim of {mctq} is to facilitate the work of sleep and chronobiology scientists with MCTQ data while also helping with research reproducibility.

Code repository:
https://github.com/gipso/mctq

Documentation website:
https://gipso.github.io/mctq

The MCTQ questionnaire

Munich ChronoType Questionnaire (MCTQ)

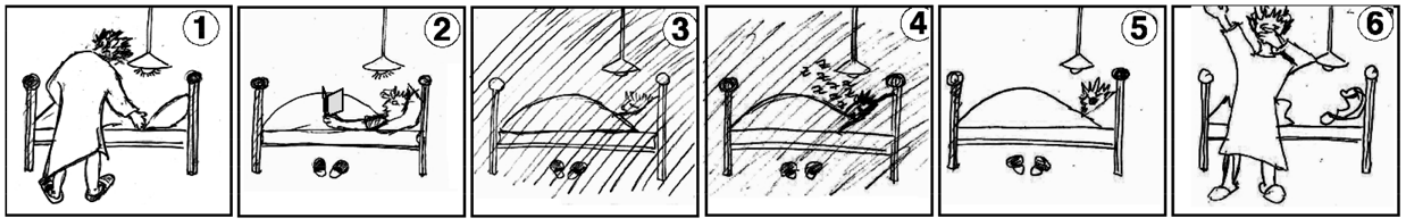
In this questionnaire, you report on your typical sleep behaviour over the past 4 weeks. We ask about work days and work-free days separately. Please respond to the questions according to your perception of a standard week that includes your usual work days and work-free days.

I have a regular work schedule (this includes being, for example, a housewife or househusband):

Yes ☐ I work on 1☐ 2☐ 3☐ 4☐ 5☐ 6☐ 7☐ days per week.

No ☐

Is your answer "*Yes, on 7 days*" or "*No*", please consider if your sleep times may nonetheless differ between regular 'workdays' and 'weekend days' and fill out the MCTQ in this respect.



Please use 24-hour time scale (e.g. 23:00 instead of 11:00 pm)!

Workdays

Image 1: **I go to bed at _____ o'clock.**

Image 2: **Note that some people stay awake for some time when in bed!**

Image 3: **I actually get ready to fall asleep at _____ o'clock.**

Please use 24-hour time scale (e.g. 23:00 instead of 11:00 pm)!

Workdays

Image 1: I go to bed at _____ o'clock.

Image 2: Note that some people stay awake for some time when in bed!

Image 3: I actually get ready to fall asleep at _____ o'clock.

Image 4: I need _____ minutes to fall asleep.

Image 5: I wake up at _____ o'clock.

Image 6: After _____ minutes I get up.

I use an alarm clock on workdays: Yes ☐ No ☐

If "Yes": I regularly wake up BEFORE the alarm rings: Yes ☐ No ☐

Free Days

Image 1: I go to bed at _____ o'clock.

Image 2: Note that some people stay awake for some time when in bed!

Image 3: I actually get ready to fall asleep at _____ o'clock.

Image 4: I need _____ minutes to fall asleep.

Image 5: I wake up at _____ o'clock.

Image 6: After _____ minutes I get up.

My wake-up time (Image 5) is due to the use of an alarm clock: Yes ☐ No ☐

There are particular reasons why I cannot freely choose my sleep times on free days:

Yes ☐ If "Yes": Child(ren)/pet(s) ☐ Hobbies ☐ Others ☐, for example:_____

No ☐

Main challenges

- MCTQ requires a lot of date/time manipulation.
- Lack of consistency in computations.
- Inconsistencies can lead to irreproducible results.

The {mctq} package

Workdays and work-free days variables

- `fd()`: compute MCTQ work-free days.
- `so()`: compute MCTQ local time of sleep onset.
- `gu()`: compute MCTQ local time of getting out of bed.
- `sdu()`: compute MCTQ sleep duration.
- `tbt()`: compute MCTQ total time in bed.
- `msl()`: compute MCTQ local time of mid-sleep.
- `napd()`: compute MCTQ nap duration (only for MCTQ Shift).
- `sd24()`: compute MCTQ 24 hours sleep duration (only for MCTQ Shift).

Combining workdays and work-free days variables

- `sd_week()`: compute MCTQ average weekly sleep duration.
- `sd_overall()`: compute MCTQ overall sleep duration (only for MCTQ Shift).
- `sloss_week()`: compute MCTQ weekly sleep loss.
- `le_week()`: compute MCTQ average weekly light exposure.
- `msf_sc()`: compute MCTQ chronotype or corrected local time of mid-sleep on work-free days.
- `sjl_rel()` and `sjl()`: compute MCTQ social jet lag.
- `sjl_weighted()`: compute MCTQ absolute social jetlag across all shifts (only for MCTQ Shift).

Combining workdays and work-free days variables

Example:

```
# Local time of mid-sleep on workdays
msw <- c(hms::parse_hm("02:05"), hms::parse_hm("04:05"))
# Local time of mid-sleep on work-free days
msf <- c(hms::parse_hm("23:05"), hms::parse_hm("08:30"))
# Relative social jetlag
sjl_rel(msw, msf)
```

```
## [1] "-10800s (~-3 hours)"  "15900s (~4.42 hours)"
```

Final remarks

Notes

- {mctq} is currently under a rOpenSci software peer review.
- We plan to submit {mctq} to CRAN soon after the review process ends.
- We plan to invite the MCTQ authors to review and author the package.
- An article about {mctq} will be published soon.

Thank you!