Physiopy: a Python suite for handling physiological data recorded in MRI settings

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Interested in collaborating? Please contact: physiopy.community@gmail.com

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HIGHLIGHTS

Natural fluctuations in autonomic physiology, such as breathing and heart rate, **provide windows** into critical functions including cognition, emotion, and health [1-4], and can **heavily influence** fMRI signals [5].

WHY PHYSIOPY?

Sparking interest in physiology	In neuroimaging, integration of physiological measures to data collection and analyses is still a niche topic. By raising awareness, we can inspire researchers and clinicians to become interested in the topic.
The more we share, the better it gets	Sharing physiological data, toolboxes, and documentation following Open Science concepts could improve exposure of this topic and help bridge knowledge with other communities (e.g. Turing Way).
This is (not) the way!	*Community practices* meetings, consensus, and documentation allow us to find common ground and stay up-to-date with how best to gather and interact with physiological data.
Of the people, by the people, for the people	Physiopy is using a *Community driven, BIDS-based, Open Development** approach. We seek integration and collaboration with wider open science initiatives in our communities!

AIMS OF PHYSIOPY

The main goal of *physiopy* is to help collect, analyze and share physiological data.

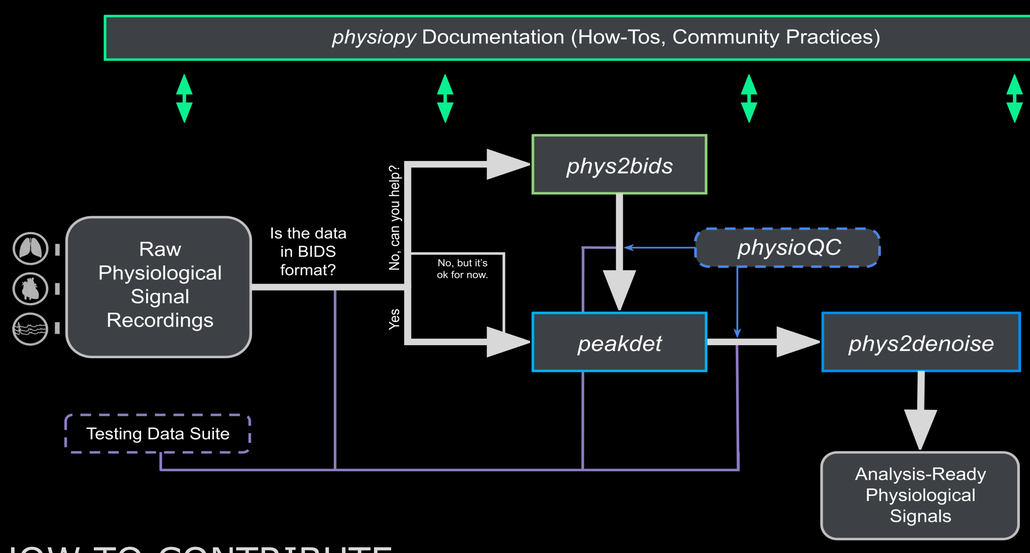
We do so by:

1. Writing packages to make user-friendly pipelines to work with physiological data.
2. Specializing in physiological data use in neuroimaging (i.e. MRI) analysis
3. Providing documentation containing tips and strategies on how to collect such data and use our packages.
4. Helping set a standard for these data, without forcing users to use it.
5. (Bonus aim) It is an excuse of educational kind. We learn new topics like Git/GitHub, Python3, visualization, Physiology and related tools/software.

CORE COMPONENTS OF PHYSIOPY

- A set of easily adoptable toolboxes implemented in Python
- Clear and approachable documentation
- Community practices based on consensus
- Community of users, developers, and researchers interested in physiology

PHYSIOPY LIBRARIES



HOW TO CONTRIBUTE

- Contribute through github projects, our repos have open issues.
- Use physiopy's packages and report issues if you find any.
- Now through Github Actions, your contributions are recognized on first issue, PR or merge 🎉
- Share Physiopy's documentation and discuss the community practices within your research group.
- Join our community practices meetings, every 3rd Thursday of the month @16h00 UTC.

**Open Source Software Development* is the idea of developing a software publicly, sharing it from the beginning of the development, fostering a democratic community of contributors in support of the project, using version control and software testing.

LIBRARIES AND UPDATES

Phys2bids – for converting physiological recordings into BIDS format

- Currently supports AcqKnowledge (BIOPAC), Labchart (ADInstruments), Spike2, and GE files

peakdet – for signal processing

- Automatic peak detection and manual correction in physiological data

Phys2denoise – to create physiological signal regressors from recordings

- Supports common denoising methods on cardiac and respiratory data

physiopy community practices is a pillar of physiopy, meant to guide new users

- Launched the v2024.0.0 version of Community Practices guidelines, written and revised by the experts of our community
- Organized into sections from data collection to processing to provide concise introductions to relevant topics and practical tips from experts who use physiological measures in their everyday research

Automated internal workflows

- Implemented GitHub Actions and Apps to automate common project management tasks (issues/PRs) to reduce time and bring more consistency

WORK IN PROGRESS

physioQC

- For quality control of physiological files at various steps of processing, to help ensure data quality

BIDS Extension Proposal for physiological signal derivatives

- For a standardized framework to organize downstream physiological data (derivatives e.g heart rate variability, respiration volume, etc.) are not yet covered by the BIDS specification. We are currently preparing a proposal

Physiopy: the unified workflow for packages

- Through Google Summer of Code 2024, we are developing a user-friendly cross-package CLI

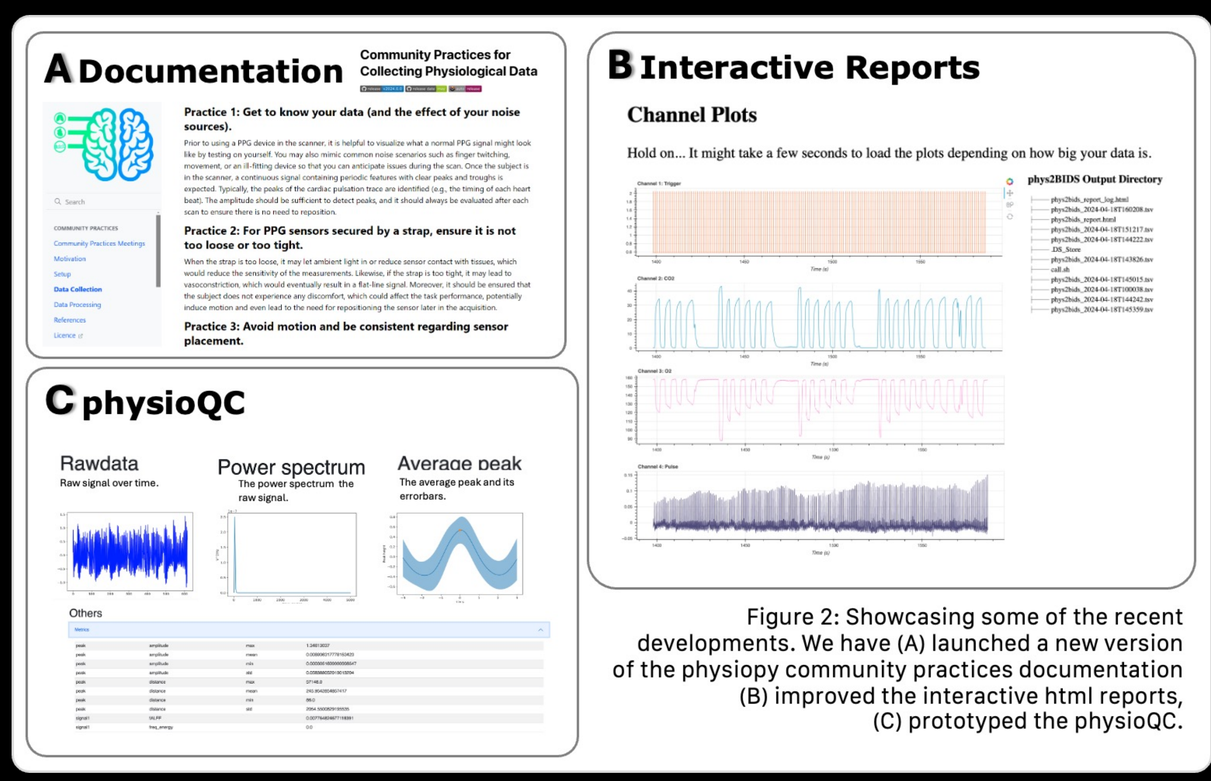


Figure 2: Showcasing some of the recent developments. We have (A) launched a new version of the physiopy community practices documentation (B) improved the interactive html reports, (C) prototyped the physioQC.

CONTRIBUTORS

Check out our website!

physiopy.github.io

REFERENCES

[1] Barrett and Simmons (2015), PMID: 26016744
[2] Shokri-Kojori et al. (2018), PMID: 30566618
[3] Azzalini et al. (2019), PMID: 31047813
[4] Koban et al. (2021), PMID: 33790441
[5] Uddin (2020), PMID: 32600967