METAPSY

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The Metapsy Initiative

Features and Technical Infrastructure of a "Meta-Analytic Research Domain" for Psychological Treatments

Mathias Harrer[1,2], Clara Miguel[2], Toshi A. Furukawa[3], Eirini Karyotaki[2], Pim Cuijpers[2,4,5], on behalf of the Metapsy collaboration

[1]Department of Psychiatry and Psychotherapy, School of Medicine, Technical University of Munich, Munich, Germany; [2]Department of Clinical, Neuro and Developmental Psychology, Vrije Universiteit Amsterdam, the Netherlands; [3]Department of Health Promotion and Human Behavior, Kyoto University School of Public Health, Kyoto, Japan; [4]Babeș-Bolyai University, International Institute for Psychotherapy, Cluj-Napoca, Romania; [5]WHO Collaborating Centre for Research and Dissemination of Psychological Interventions, Amsterdam, the Netherlands

Background

In mental health research, countless randomized controlled trials and meta-analyses are published each year. This makes it increasingly difficult to keep track of all existing evidence, and to draw actionable conclusions from it. As a solution, meta-analytic research domains (MARDs) have been proposed[1]. MARDs aim to compile the evidence of an entire research field, providing an ecosystem of open databases and tailored software that allows for rapid evidence generation. Establishing MARDs within a research field could have several benefits, including:

- **Unified protocols** for the study search, data extraction, coding, and quality assessment
- Provision of all available research data in a **standardized, interoperable format**
- **Centralized documentation** for all databases and their underlying methodology
- **Up-to-date information** on emerging research topics due to frequent search updates
- Greater reusability of meta-analytic evidence for different stakeholders thanks to **research software** and **graphical user interfaces** developed for a MARD.

Overall, this could provide a unified, collaborative framework for meta-analytic research in a specific field of investigation.

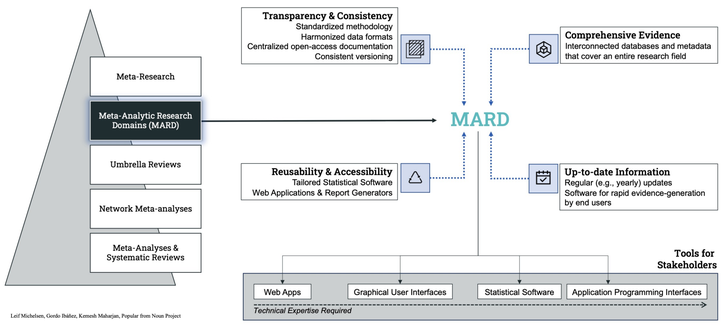


Figure 1. *Features of Meta-Analytic Research Domains (MARDs)*

Overview

The **Metapsy initiative** (metapsy.org) maintains a MARD for psychological treatment trials across all major mental disorders (see Figure 2). All living databases are actively maintained and updated at least yearly. The initiative is based on an international collaboration of research universities and government agencies, including the U.S. Department of Veterans Affairs, and the Dutch organization for suicide prevention. The project is embedded in the WHO Collaborating Centre for Research and Dissemination of Psychological Interventions (VU University Amsterdam). Its data and software infrastructure has been developed at the Technical University of Munich over the last two years.

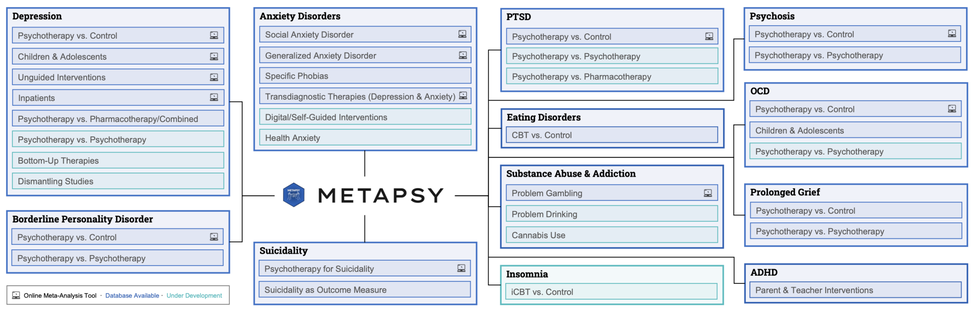


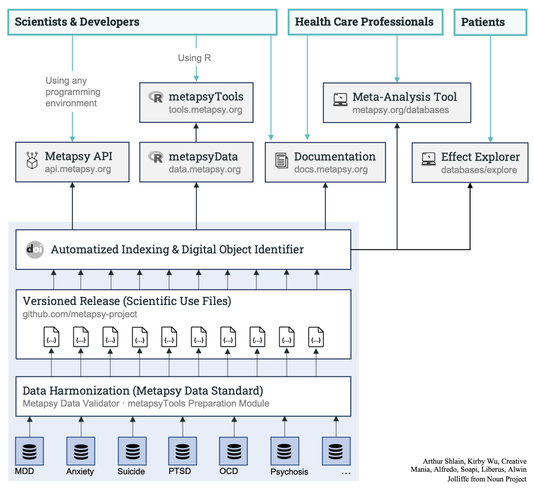
Figure 2. *Living databases included in the Metapsy MARD*

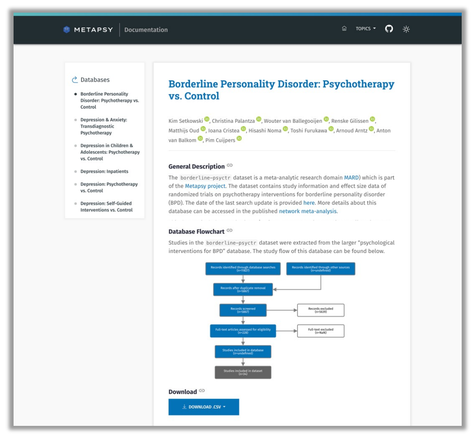
Data Harmonization & Validation

Metapsy employs a uniform data standard that all meta-analytic databases adhere to. This standard also defines the data storage and metadata, ensuring full compliance with the **FAIR principles**[2]. All information is compiled in machine-readable formats and harmonized using a standardized codebook, including a consistent taxonomy to classify treatments and comparators. These harmonization steps ensure that databases can easily be filtered and merged, allowing to examine patterns across various mental disorders[3]. Before their release, databases are bundled into **scientific use files** (SUFs) for a specific research question. Compliance with the data standard is confirmed using an online validator tool (tools.metapsy.org/data-validator), which also calculates the outcome measures and their sampling variance.

Data Release & Documentation

All database updates are released under an open ODC-By license, allowing their re-use for any purpose. A *Git*-based versioning system is employed, ensuring that older versions remain reproducible as new updates are released. Using an **automatized release flow**, DOIs are minted for each update, and changes are propagated to all software components. This includes a technical documentation page (docs.metapsy.org) providing all relevant metadata for meta-analytic projects (search strings/dates, PRISMA flow chart, trial references, …).

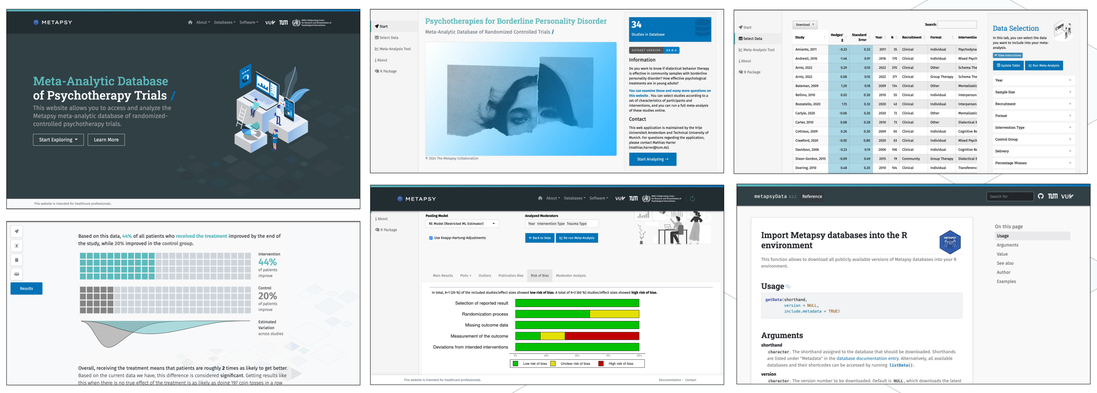




Software & Online Tools

The Metapsy initiative maintains a range of software packages and online tools aimed at facilitating the re-use of the collected evidence for various stakeholders (researchers, guideline developers, clinicians, patients). This includes two **R packages** to import existing databases directly into an R environment (data.metapsy.org), and to run a full meta-analysis pipeline "out-of-the-box" (tools.metapsy.org). For software developers, we also maintain our own REST **API** (metapsy.org/api), which can be used to retrieve all database versions and their metadata.

For most SUFs, **online meta-analysis tools** have been developed, which can be used to generate meta-analytic evidence for specific research questions through a user-friendly interface. Results can be exported in a PDF with a unique tracking ID, documenting the selected analytic choices, database versions and study data, thus ensuring their reproducibility. For clinicians, meta-analytic evidence across various disorders can be examined in an online "effect explorer".



Discussion

MARDs have the potential to increase the scope, flexibility, reproducibility, and usability of meta-analytic research; but they are certainly no panacea. Challenges include the considerable resources needed to develop and maintain living databases across a wide range of indications, and to coordinate multiple research teams. Once implemented, methodological deficiencies of a MARD may also be difficult to repair. Lastly, user-friendly tools provided by MARDs may also be a "double-edged sword": they allow for much more rapid evidence generation by relevant stakeholders (e.g., guideline developers) but may also increase the risk of misuse.

[1]Cuijpers, P., Miguel, C., Papola, D., Harrer, M., & Karyotaki, E. (2022). *BMJ Ment Health, 25*(4), 145-147.
[2]Wilkinson, M. D., Dumontier, M., Aalbersberg, Ij. J., Appleton, G., Axton, M., Baak, A., …, Bourne, P. E. (2016). *Scientific Data, 3*(1), 1-9.
[3]Cuijpers, P., Miguel, C., Ciharova, M., Harrer, M., Basic, D., Cristea, I.A., …, Karyotaki, E. (2024). *World Psychiatry, 23*(2), 267-275.

mathias.harrer@tum.de · mharrer.dev · @MathiasHarrer

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