

The Neuroimaging Meta-analysis Database: a data-sharing initiative for neuroimaging meta-analyses

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E-Poster

Introduction:

There is currently a growing number of online repositories which collate standardized results from neuroimaging experiments, including Brainmap.org [1] and Neurovault.org [2]. These databases enable researchers to perform meta-analyses, such as activation likelihood estimation (ALE) [3] or meta-analytic connectivity modelling (MACM) [4], on a much larger set of data than is typically available from single studies. Meta-analytic results are useful as robust prior information for designing future task-based fMRI studies, as a-priori seed regions for correlational methods, or as a reference frame for data-driven parcellation methods such as connectivity-based parcellation (CBP) [5]. While the number of meta-analytic studies is growing, there is currently no way of accessing their results in a standard, convenient way. This has motivated the development of a new data repository, dedicated specifically to the collation of results of published meta-analytic studies.

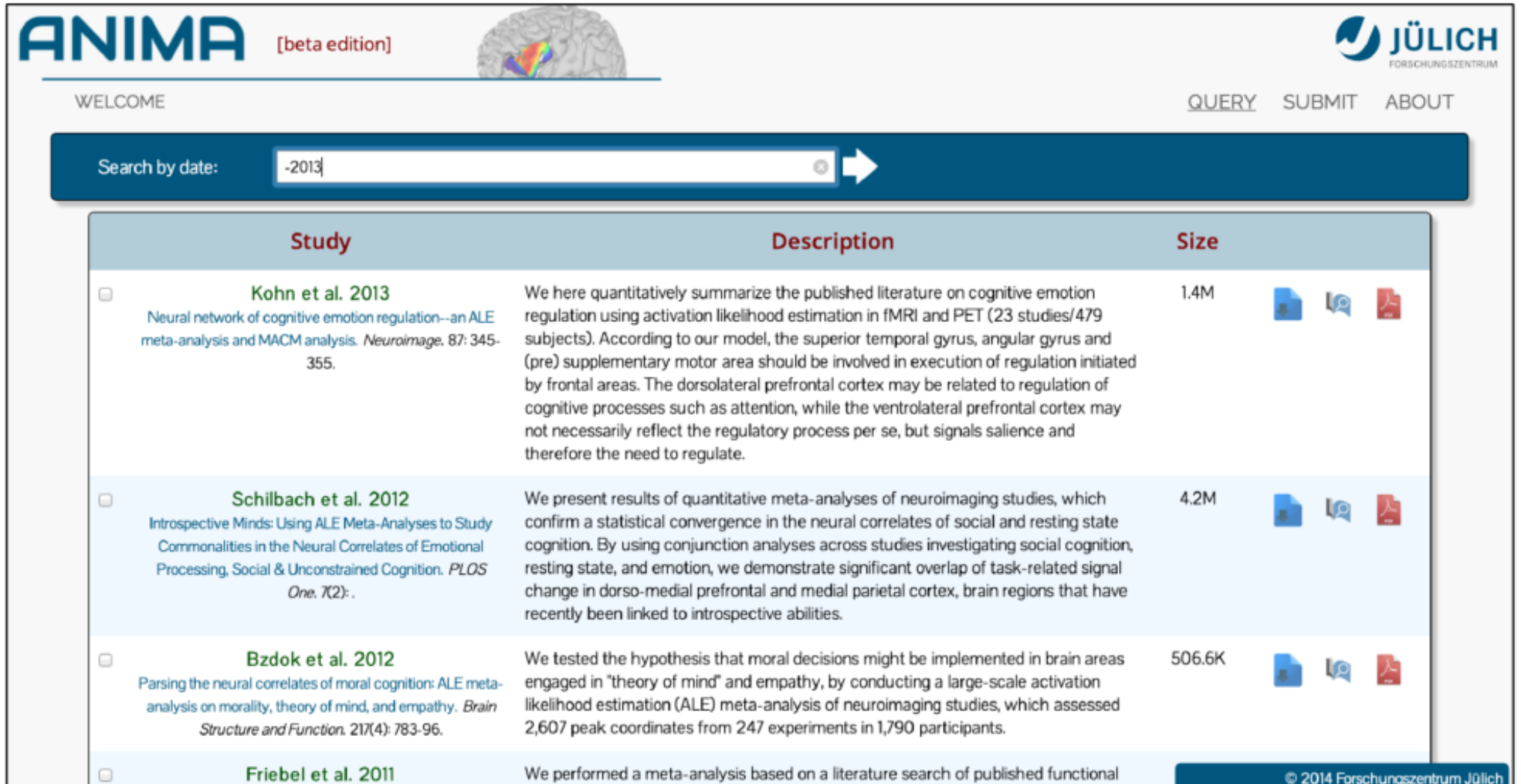
Methods:

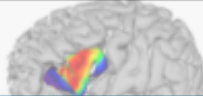

The Archives of Neuroimaging Meta-Analyses (ANIMA) platform consists of two main components. The first is a searchable online repository, which includes an intuitive data entry page for researchers to enter their own studies. Studies consist of metadata describing the article, along with any number

of brain images corresponding to figures or supplemental material. The second is a stand-alone Java-based viewer tool called Volume Viewer. This viewer integrates seamlessly with the online database through a Library panel, which organizes all downloaded studies via a simple, easily navigable interface. Volume Viewer allows users to load and composite multiple images, providing an easy means of overlaying new results with existing ones, as well as the ability to extract new regions-of-interest from overlapping distributions. The application also provides an extensive set of colour maps, templates, and atlases against which to cross-reference one's data. Overlay and colour configurations can be saved as XML-format "session" files, which can also be shared as part of an ANIMA study.


Results:










Figure 1 shows a screenshot of the "Query" page of the beta version of the ANIMA online interface. At present, the results of 17 meta-analytic studies have been entered. Data can be filtered by author, date, or keywords, using a search bar at the top of the page. Each study can be downloaded by clicking an icon, and links are also provided for PubMed entries and full-text article PDF files. Figure 2 shows the "Submit" page of ANIMA, which provides an intuitive interface for submitting new studies. A researcher first enters information about the study, then any number of individual images, Volume Viewer sessions, or text files. Finally, the study is submitted for review by a database curator, who will ensure that the submission is complete, and inform the researcher by email once it is accepted. Figure 3 shows a screenshot of the beta version of the standalone Volume Viewer tool. Study data can be accessed using the panel at the left, and visualized with respect to templates, atlases, or other data.



ANIMA [beta edition]  

WELCOME QUERY SUBMIT ABOUT

Search by date: 

| Study | Description | Size |
|--|---|---|
| <input type="checkbox"/> Kohn et al. 2013 Neural network of cognitive emotion regulation--an ALE meta-analysis and MACM analysis. <i>Neuroimage</i> . 87: 345-355. | We here quantitatively summarize the published literature on cognitive emotion regulation using activation likelihood estimation in fMRI and PET (23 studies/479 subjects). According to our model, the superior temporal gyrus, angular gyrus and (pre) supplementary motor area should be involved in execution of regulation initiated by frontal areas. The dorsolateral prefrontal cortex may be related to regulation of cognitive processes such as attention, while the ventrolateral prefrontal cortex may not necessarily reflect the regulatory process per se, but signals salience and therefore the need to regulate. | 1.4M    |
| <input type="checkbox"/> Schilbach et al. 2012 Introspective Minds: Using ALE Meta-Analyses to Study Commonalities in the Neural Correlates of Emotional Processing, Social & Unconstrained Cognition. <i>PLOS One</i> . 7(2): . | We present results of quantitative meta-analyses of neuroimaging studies, which confirm a statistical convergence in the neural correlates of social and resting state cognition. By using conjunction analyses across studies investigating social cognition, resting state, and emotion, we demonstrate significant overlap of task-related signal change in dorso-medial prefrontal and medial parietal cortex, brain regions that have recently been linked to introspective abilities. | 4.2M    |
| <input type="checkbox"/> Bzdok et al. 2012 Parsing the neural correlates of moral cognition: ALE meta-analysis on morality, theory of mind, and empathy. <i>Brain Structure and Function</i> . 217(4): 783-96. | We tested the hypothesis that moral decisions might be implemented in brain areas engaged in "theory of mind" and empathy, by conducting a large-scale activation likelihood estimation (ALE) meta-analysis of neuroimaging studies, which assessed 2,607 peak coordinates from 247 experiments in 1,790 participants. | 506.6K    |
| <input type="checkbox"/> Friebel et al. 2011 | We performed a meta-analysis based on a literature search of published functional | |

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Figure 1. Screenshot of the ANIMA online interface, showing the main query page. The database can be filtered by author, date, or keywords (blue search bar). Buttons at the right of each study entry allow the user to download the study data, browse its PubMed entry, or view its full-text PDF.

ANIMA

[beta edition]

INSTRUCTIONS
QUERY
SUBMIT
ABOUT

PROFILE
STUDY
ELEMENTS
SUBMIT

Enter a new study element

Name

Type

Caption

File

| Name | Type | File | Caption | |
|------------------------|------------|---------------|--|---------------|
| Figure 2 (hard > easy) | VolumeFile | Hard>Easy.nii | Figure 2. The significant Activation Likelihood Estimate (ALE) clusters for the three separate ALE analyses in standard Montreal Neurological Institute space. Red: Task > Control; blue: Hard > Easy; green: Reward > Control. Numbers indicate Z coordinates in MNI space. | Edit Delete |

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Figure 2. A screenshot of the ANIMA online interface, showing the data submission screen. Users can upload their data using a series of tabs, and submit the study for consideration by the database curators. Single volume files can be submitted, along with Volume Viewer sessions containing pre-configured sets of images, templates,

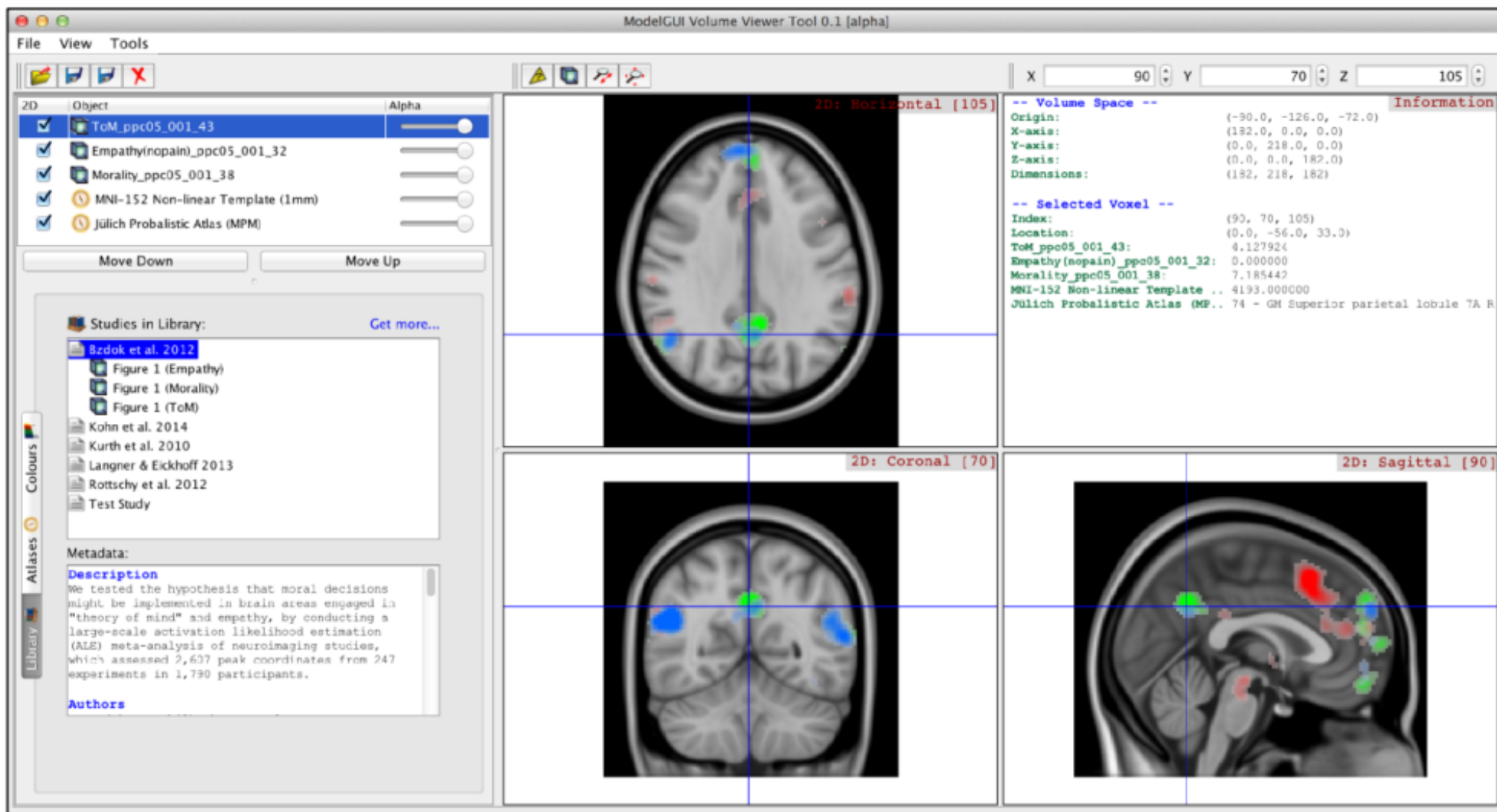


Figure 3. Screenshot of the Volume Viewer tool. Studies downloaded from ANIMA can be organized into a Library, as shown in the tab at bottom left. The session shown includes the three results contained in Figure 1 of Bzdok et al. (2012), concerning morality (green), empathy (red), and theory of mind (blue). Also

Conclusions:

We present a new database that, for the first time, makes the results of neuroimaging meta-analyses publicly available in a standard and convenient way. The database currently provides access to the results of 17 published studies, and also allows researchers to upload their own studies. These data can be used as a basis for a new study, for cross-referencing one's own results, or reproducing or expanding upon already published results. Furthermore, the open-source, extensible Volume Viewer tool provides a convenient and powerful means of directly visualizing and querying neuroimaging data, both from ANIMA and otherwise.

Imaging Methods:BOLD fMRI ²**Informatics:**

Brain Atlases

Databasing and Data Sharing ¹**Poster Session:**

Poster Session - Thursday

Keywords:

Atlasing

Data Organization

FUNCTIONAL MRI

Meta- Analysis

¹²*Indicates the priority used for review***Would you accept an oral presentation if your abstract is selected for an oral session?**

Yes

Please indicate below if your study was a "resting state" or "task-activation" study.

Task-activation

Healthy subjects only or patients (note that patient studies may also involve healthy subjects):

Patients

Internal Review Board (IRB) or Animal Use and Care Committee (AUCC) Approval. Please indicate approval below. Please note: Failure to have IRB or AUCC approval, if applicable will lead to automatic rejection of abstract.

Not applicable

Please indicate which methods were used in your research:

Functional MRI

For human MRI, what field strength scanner do you use?

1.5T

3.0T

Which processing packages did you use for your study?

Other, Please list - ModelGUI

Provide references in author date format

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