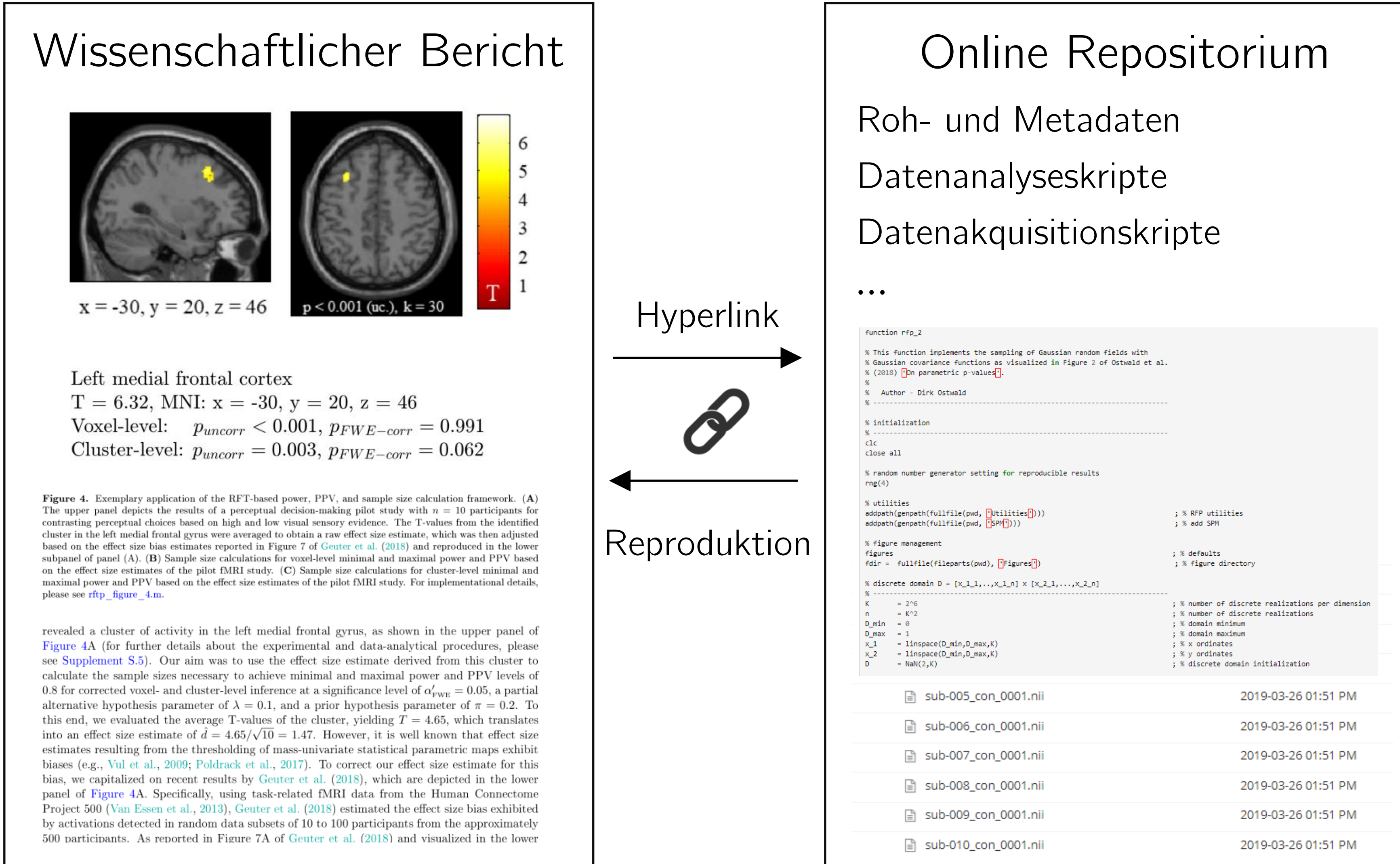

Wissenschaftlicher Bericht
x = -30, y = 20, z = 46
p < 0.001 (uc.), k = 30
6
5
4
3
2
1
T
Left medial frontal cortex
T = 6.32, MNI: x = -30, y = 20, z = 46
Voxel-level: $p_{uncorr} < 0.001$, $p_{FWE-corr} = 0.991$
Cluster-level: $p_{uncorr} = 0.003$, $p_{FWE-corr} = 0.062$
Figure 4. Exemplary application of the RFT-based power, PPV, and sample size calculation framework. (A) The upper panel depicts the results of a perceptual decision-making pilot study with $n = 10$ participants for contrasting perceptual choices based on high and low visual sensory evidence. The T-values from the identified cluster in the left medial frontal gyrus were averaged to obtain a raw effect size estimate, which was then adjusted based on the effect size bias estimates reported in Figure 7 of Geuter et al. (2018) and reproduced in the lower subpanel of panel (A). (B) Sample size calculations for voxel-level minimal and maximal power and PPV based on the effect size estimates of the pilot fMRI study. (C) Sample size calculations for cluster-level minimal and maximal power and PPV based on the effect size estimates of the pilot fMRI study. For implementational details, please see rftp_figure_4.m.
revealed a cluster of activity in the left medial frontal gyrus, as shown in the upper panel of Figure 4A (for further details about the experimental and data-analytical procedures, please see Supplement S.5). Our aim was to use the effect size estimate derived from this cluster to calculate the sample sizes necessary to achieve minimal and maximal power and PPV levels of 0.8 for corrected voxel- and cluster-level inference at a significance level of $\alpha'_{FWE} = 0.05$, a partial alternative hypothesis parameter of $\lambda = 0.1$, and a prior hypothesis parameter of $\pi = 0.2$. To this end, we evaluated the average T-values of the cluster, yielding $T = 4.65$, which translates into an effect size estimate of $\hat{d} = 4.65/\sqrt{10} = 1.47$. However, it is well known that effect size estimates resulting from the thresholding of mass-univariate statistical parametric maps exhibit biases (e.g., Vul et al., 2009; Poldrack et al., 2017). To correct our effect size estimate for this bias, we capitalized on recent results by Geuter et al. (2018), which are depicted in the lower panel of Figure 4A. Specifically, using task-related fMRI data from the Human Connectome Project 500 (Van Essen et al., 2013), Geuter et al. (2018) estimated the effect size bias exhibited by activations detected in random data subsets of 10 to 100 participants from the approximately 500 participants. As reported in Figure 7A of Geuter et al. (2018) and visualized in the lower
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...
function rfp_2
% This function implements the sampling of Gaussian random fields with
% Gaussian covariance functions as visualized in Figure 2 of Ostwald et al.
% (2018) 'On parametric p-values'.
% Author - Dirk Ostwald
% initialization
clc
close all
% random number generator setting for reproducible results
rng(4)
% utilities
addpath(genpath(fullfile(pwd, 'Utilities'))) ; % RFP utilities
addpath(genpath(fullfile(pwd, 'SPM'))) ; % add SPM
% figure management
figures ; % defaults
fdir = fullfile(fileparts(pwd), 'Figures') ; % figure directory
% discrete domain D = [x_1_1,..,x_1_n] x [x_2_1,...,x_2_n]
K = 2^6 ; % number of discrete realizations per dimension
n = K^2 ; % number of discrete realizations
D_min = 0 ; % domain minimum
D_max = 1 ; % domain maximum
x_1 = linspace(D_min,D_max,K) ; % x ordinates
x_2 = linspace(D_min,D_max,K) ; % y ordinates
D = NaN(2,K) ; % discrete domain initialization
sub-005_con_0001.nii 2019-03-26 01:51 PM
sub-006_con_0001.nii 2019-03-26 01:51 PM
sub-007_con_0001.nii 2019-03-26 01:51 PM
sub-008_con_0001.nii 2019-03-26 01:51 PM
sub-009_con_0001.nii 2019-03-26 01:51 PM
sub-010_con_0001.nii 2019-03-26 01:51 PM