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CCBS7002 COGNITIVE NEUROSCIENCE

The Impact of Sleep Deprivation on Risky Self-other Decision Making: An fMRI Study using the Balloon Analog Risk Task(BART)

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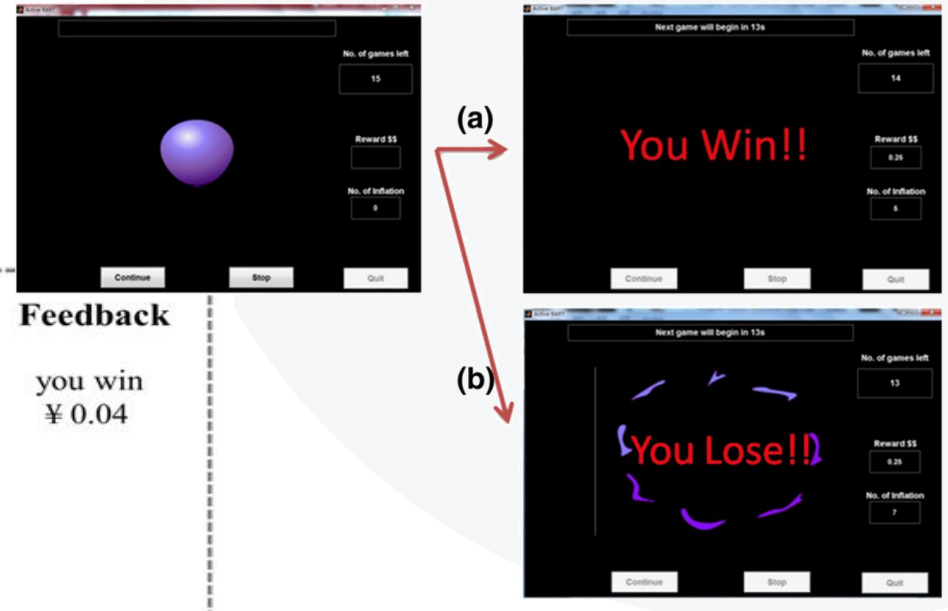
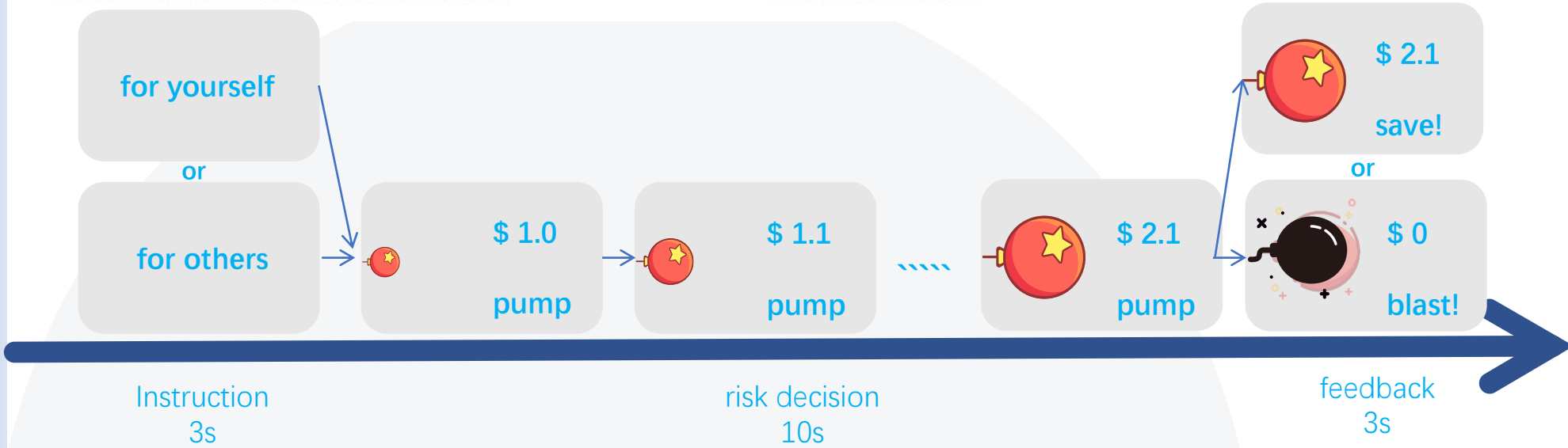
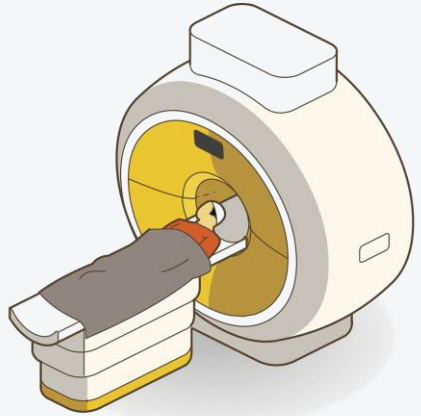
GROUP 7

Balloon Analoque Risk Task(BART)





The scanning process



participants：3（1 females）

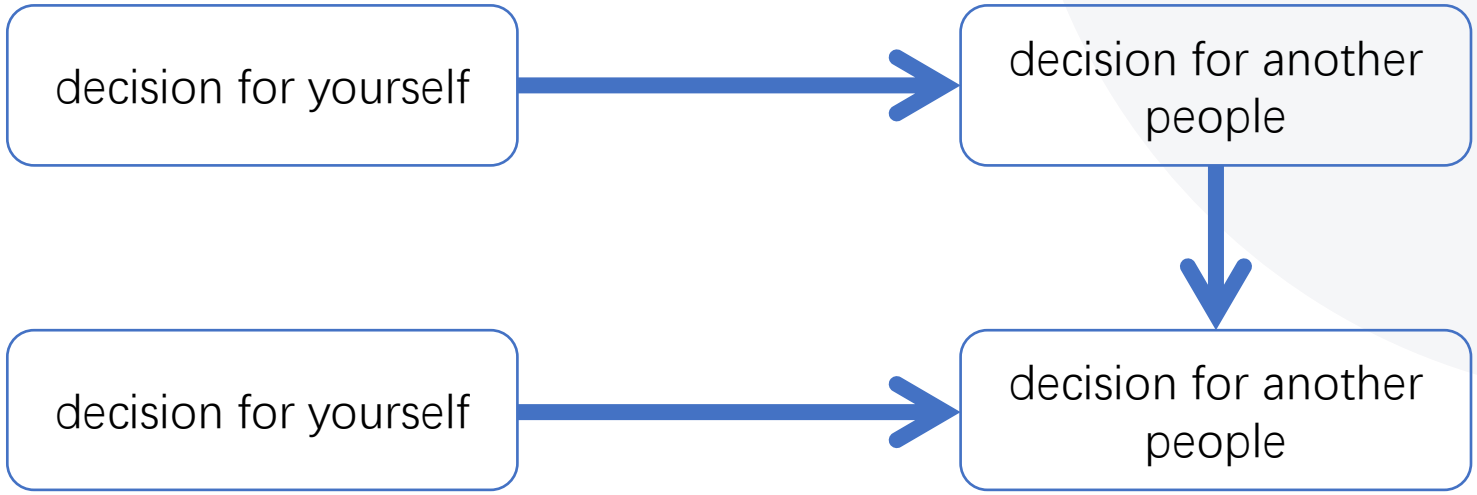
Normal sleep group → Sleep deprivation → Deprivation

Deprivation group → Normal rest → Normal sleep

3 days

First MRI scan → Second MRI scan

The experimental block



	First	second	third	fourth
participant a1	yourself	another	yourself	another
participant a2	yourself	another	yourself	another
participant b1	another	another	yourself	yourself
participant b2	another	yourself	another	yourself
participant c1	yourself	yourself	another	another
participant c2	yourself	another	yourself	another

The experimental code

```
    win.retrieveAutoDraw()
    # reset any timers
    for timer in timers:
        timer.reset()


def run(expInfo, thisExp, win, globalClock=None, thisSession=None):
    """
    Run the experiment flow.

    Parameters
    ==========
    expInfo : dict
        Information about this experiment, created by the `setupExpInfo` functio
    thisExp : psychopy.data.ExperimentHandler
        Handler object for this experiment, contains the data to save and inform
        where to save it to.
    psychopy.visual.Window
        Window in which to run this experiment.
    globalClock : psychopy.core.clock.Clock or None
        Clock to get global time from - supply None to make a new one.
    thisSession : psychopy.session.Session or None
        Handle of the Session object this experiment is being run from, if any.
    """
    # mark experiment as started
    thisExp.status = STARTED
    # make sure variables created by exec are available globally
    exec = environmenttools.setExecEnvironment(globals())
    # get device handles from dict of input devices
    ioServer = deviceManager.ioServer
    # get/create a default keyboard (e.g. to check for escape)
    defaultKeyboard = deviceManager.getDevice('defaultKeyboard')
    if defaultKeyboard is None:
        deviceManager.addDevice(
            deviceClass='keyboard', deviceName='defaultKeyboard', backend='ioHub
        )
    eyetracker = deviceManager.getDevice('eyetracker')
    # make sure we're running in the directory for this experiment
    os.chdir(_thisDir)
    # get filename from ExperimentHandler for convenience
    filename = thisExp.dataFileName
    frameTolerance = 0.001  # how close to onset before 'same' frame
    endExpNow = False  # flag for 'escape' or other condition => quit the exp
    # get frame duration from frame rate in expInfo
    if 'frameRate' in expInfo and expInfo['frameRate'] is not None:
        frameDur = 1.0 / round(expInfo['frameRate'])
    else:
        frameDur = 1.0 / 60.0  # could not measure, so guess

    # Start Code - component code to be run after the window creation
```

```
    # Start Code - component code to be run after the window creation

    # --- Initialize components for Routine "instructions" ---
    instr = visual.TextBox2(
        win, text="This is a game where you have to optimise your earnings in a
        pos=(0, 0),     letterHeight=0.03,
        size=(1, 0.5), borderWidth=2.0,
        color='white', colorSpace='rgb',
        opacity=1.0,
        bold=False, italic=False,
        lineSpacing=1.0, speechPoint=None,
        padding=None, alignment='center',
        anchor='center', overflow='visible',
        fillColor=None, borderColor=None,
        flipHoriz=False, flipVert=False, languageStyle='LTR',
        editable=False,
        name='instr',
        depth=0, autoLog=True,
    )
    resp = keyboard.Keyboard(deviceName='resp')

    # --- Initialize components for Routine "focus" ---
    textbox = visual.TextBox2(
        win, text='', placeholder='Type here...', font='Arial',
        pos=(0.5, 0.2),     letterHeight=0.05,
        size=(1, 1), borderWidth=2.0,
        color='white', colorSpace='rgb',
        opacity=None,
        bold=False, italic=False,
        lineSpacing=1.0, speechPoint=None,
        padding=0.0, alignment='center',
        anchor='center', overflow='visible',
        fillColor=None, borderColor=None,
        flipHoriz=False, flipVert=False, languageStyle='LTR',
        editable=False,
        name='textbox',
        depth=0, autoLog=True,
    )
    textbox_2 = visual.TextBox2(
        win, text='Decide for', placeholder='Type here...', font='Arial',
        pos=(0.2, 0.2),     letterHeight=0.05,
        size=(1, 1), borderWidth=2.0,
        color='white', colorSpace='rgb',
        opacity=None,
        bold=False, italic=False,
        lineSpacing=1.0, speechPoint=None,
        padding=0.0, alignment='center',
        anchor='center', overflow='visible',
        fillColor=None, borderColor=None,
        flipHoriz=False, flipVert=False, languageStyle='LTR',
```

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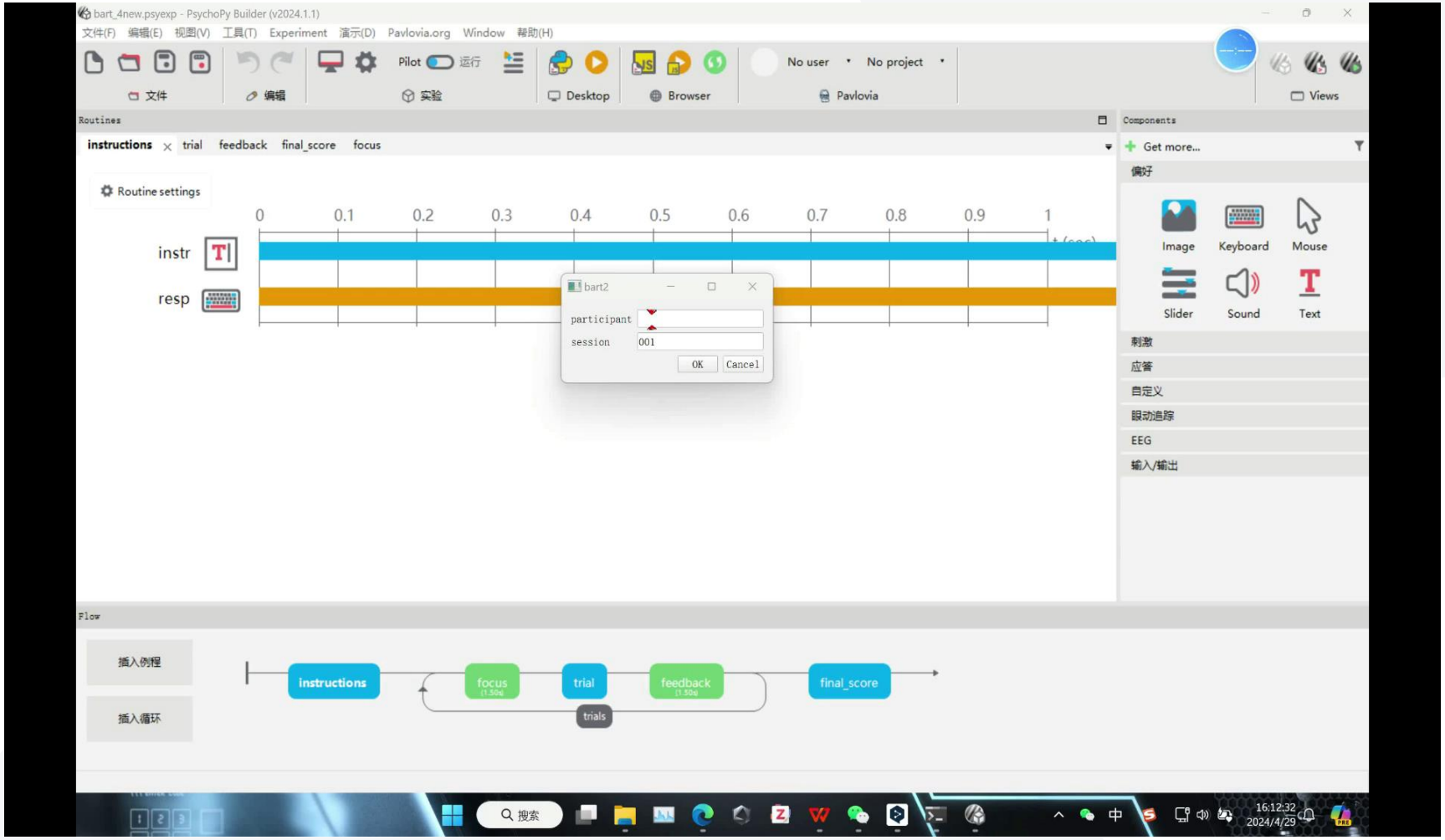
- Experimental
- Behavioral Result
- MRI Result
- Future plans
- Conclusions

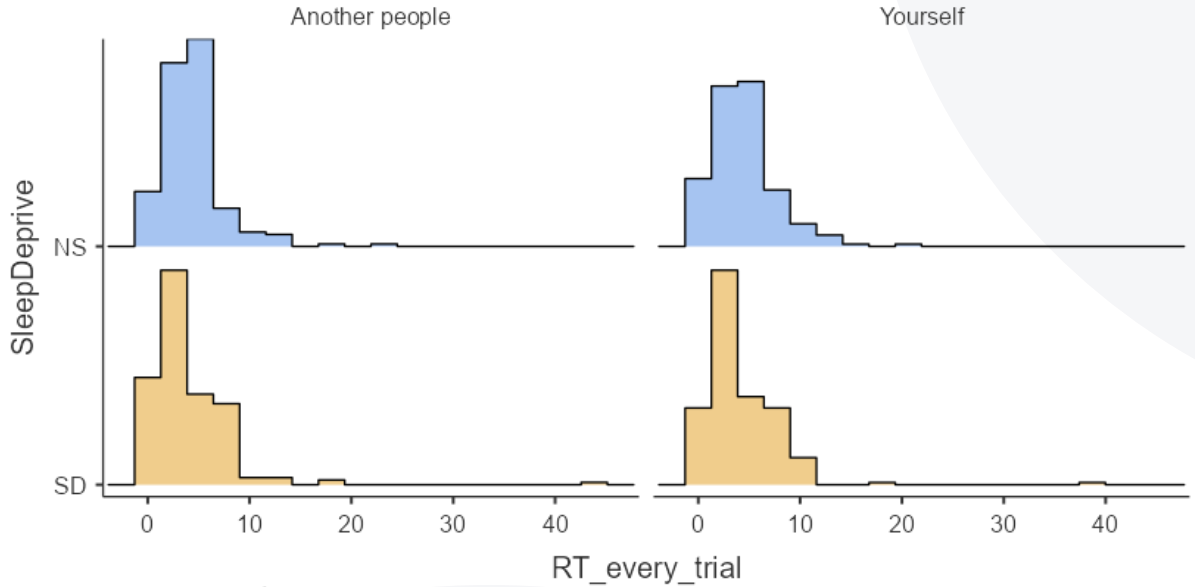
The experiment

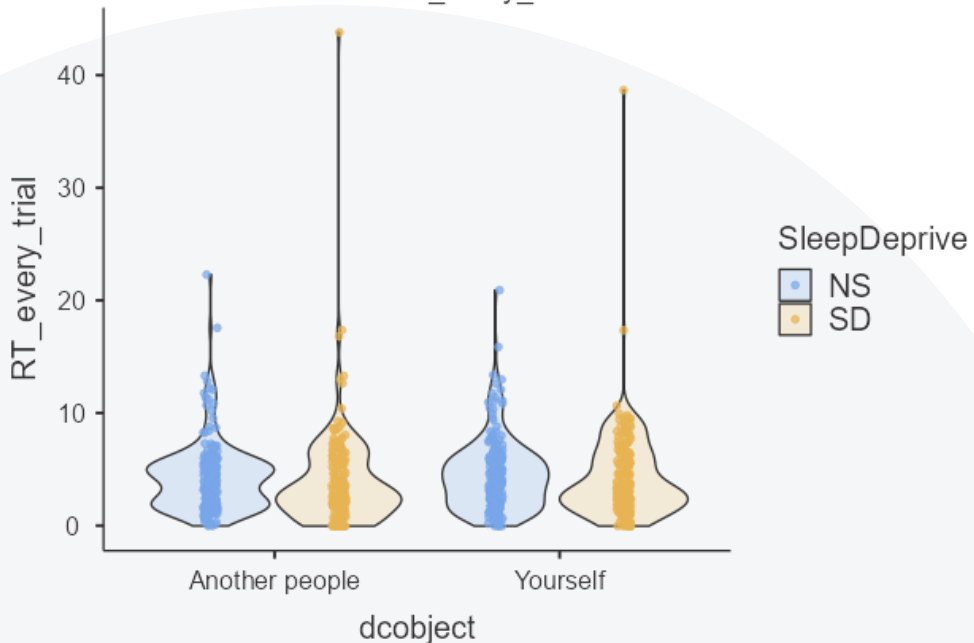


Results

Balloon Analoque Risk Task(BART)

RT





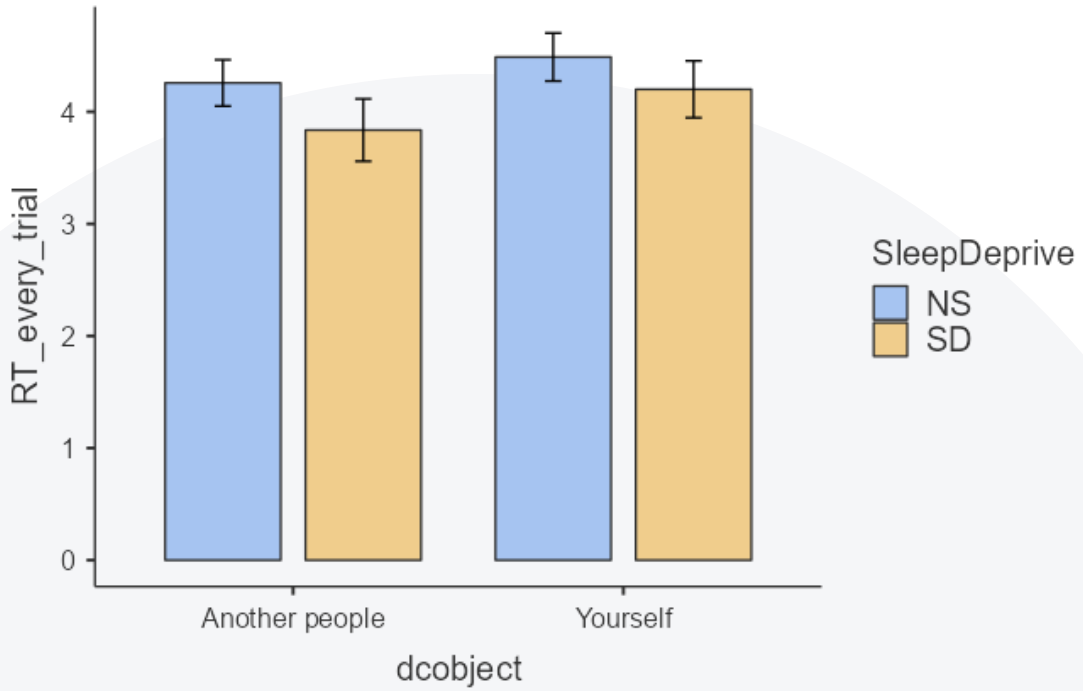
Results

Balloon Analoque Risk Task(BART)

RT

方差分析- RT_every_trial

	平方和	自由度	均方	F值	p值	η^2p
dcobject	19.07402	1	19.07402	1.53436	0.21580	0.00178
SleepDeprive	27.10301	1	27.10301	2.18023	0.14016	0.00253
dcobject * SleepDeprive	0.94945	1	0.94945	0.07638	0.78234	0.00009
残差	10690.87151	860	12.43125			



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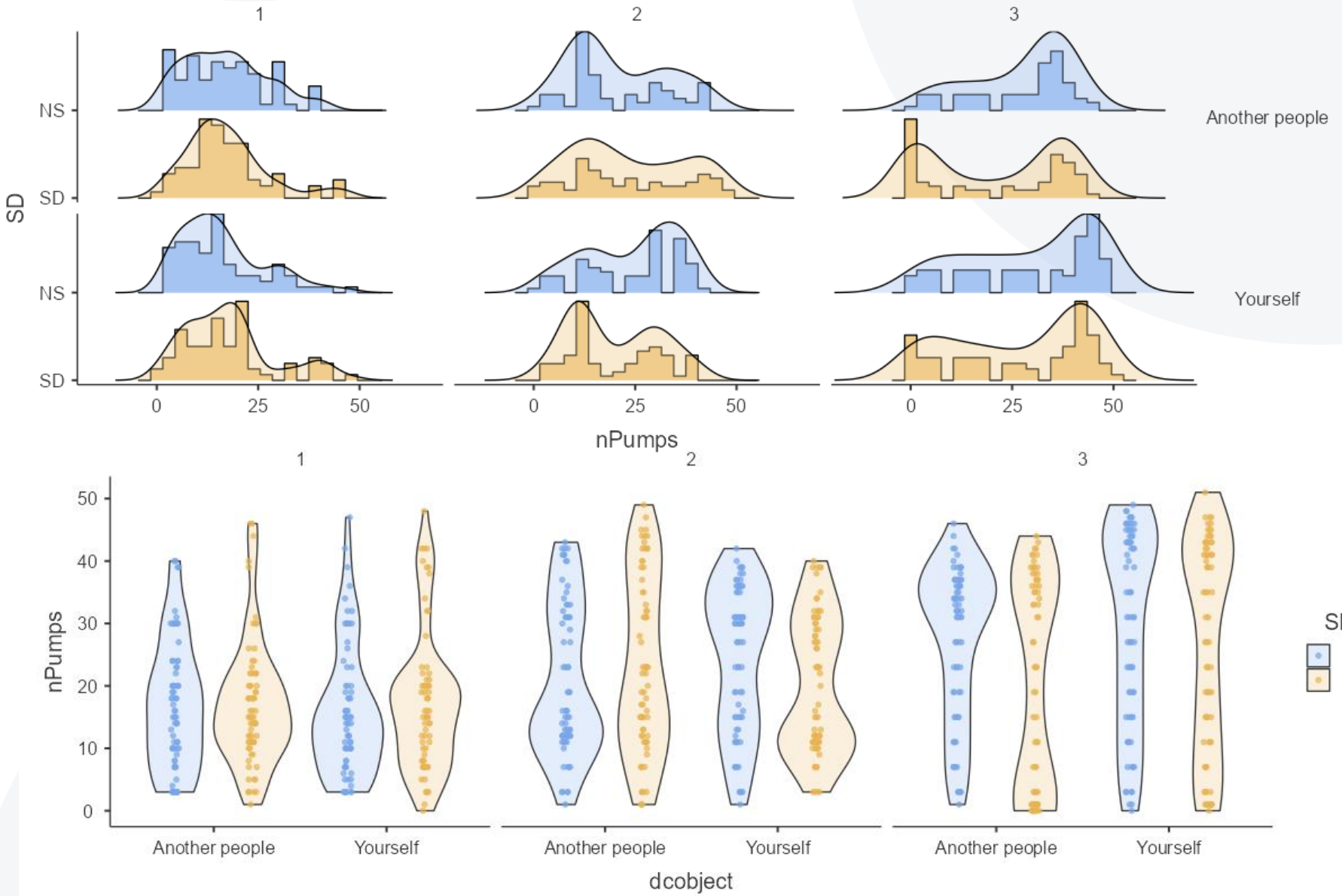
- Experimental
- Behavioral Result
- MRI Result
- Future plans
- Conclusions

Balloon Analoque Risk Task(BART)

Number of pumps



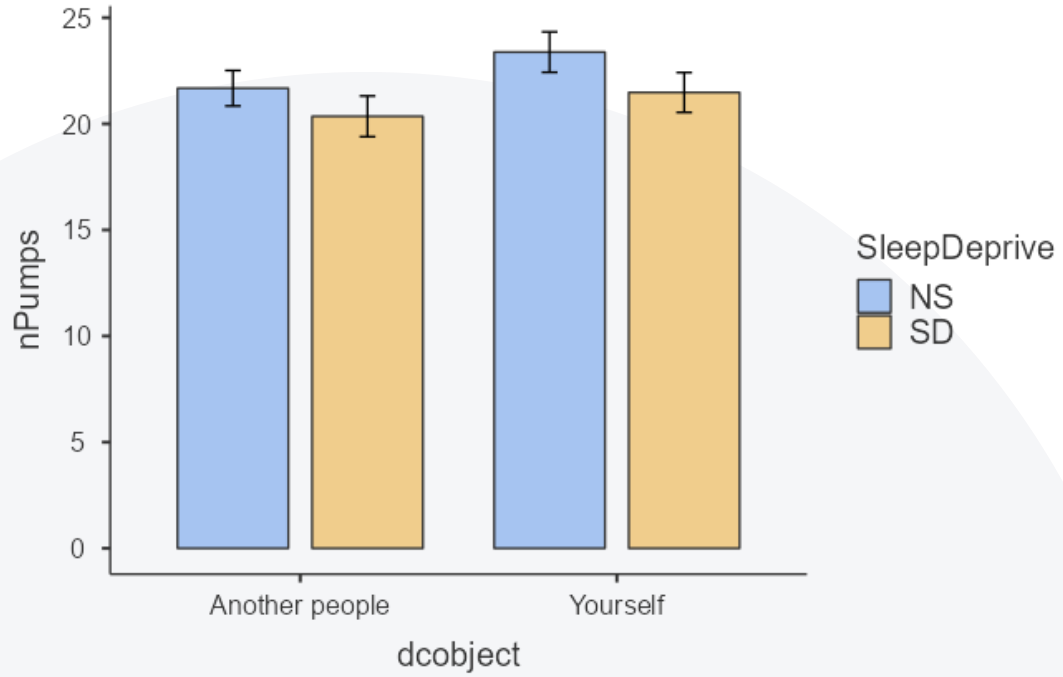
Results

Balloon Analoque Risk Task(BART)

Number of pumps

方差分析- nPumps

	平方和	自由度	均方	F值	p值	η^2p
dcobject	432.08449	1	432.08449	2.34919	0.12572	0.00272
SleepDeprive	562.27894	1	562.27894	3.05704	0.08074	0.00354
dcobject ✻ SleepDeprive	18.08449	1	18.08449	0.09832	0.75393	0.00011
残差	158179.32870	860	183.92945			



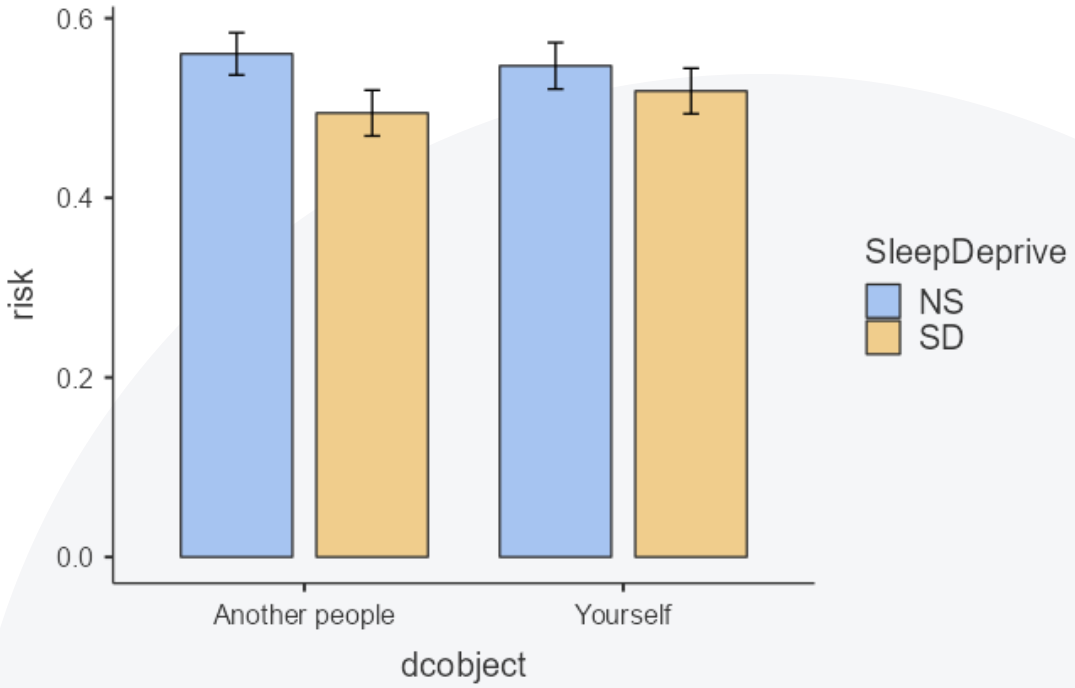
Results

Balloon Analoque Risk Task(BART)

Risk

方差分析- risk

	平方和	自由度	均方	F值	p值	η^2p
dcobject	0.00417	1	0.00417	0.04915	0.82464	0.00009
SleepDeprive	0.29580	1	0.29580	3.48691	0.06240	0.00648
dcobject * SleepDeprive	0.04800	1	0.04800	0.56583	0.45225	0.00106
残差	45.38449	535	0.08483			



Results

Balloon Analoque Risk Task(BART)

Winning number

组内效应

	平方和	自由度	均方	F值	p值	η^2_p
dcobject	90.75000	1	90.75000	4.59494	0.16529	0.69674
残差	39.50000	2	19.75000			
sleep	44.08333	1	44.08333	3.13018	0.21888	0.61015
残差	28.16667	2	14.08333			
dcobject * sleep	4.08333	1	4.08333	0.14286	0.74180	0.06667
残差	57.16667	2	28.58333			

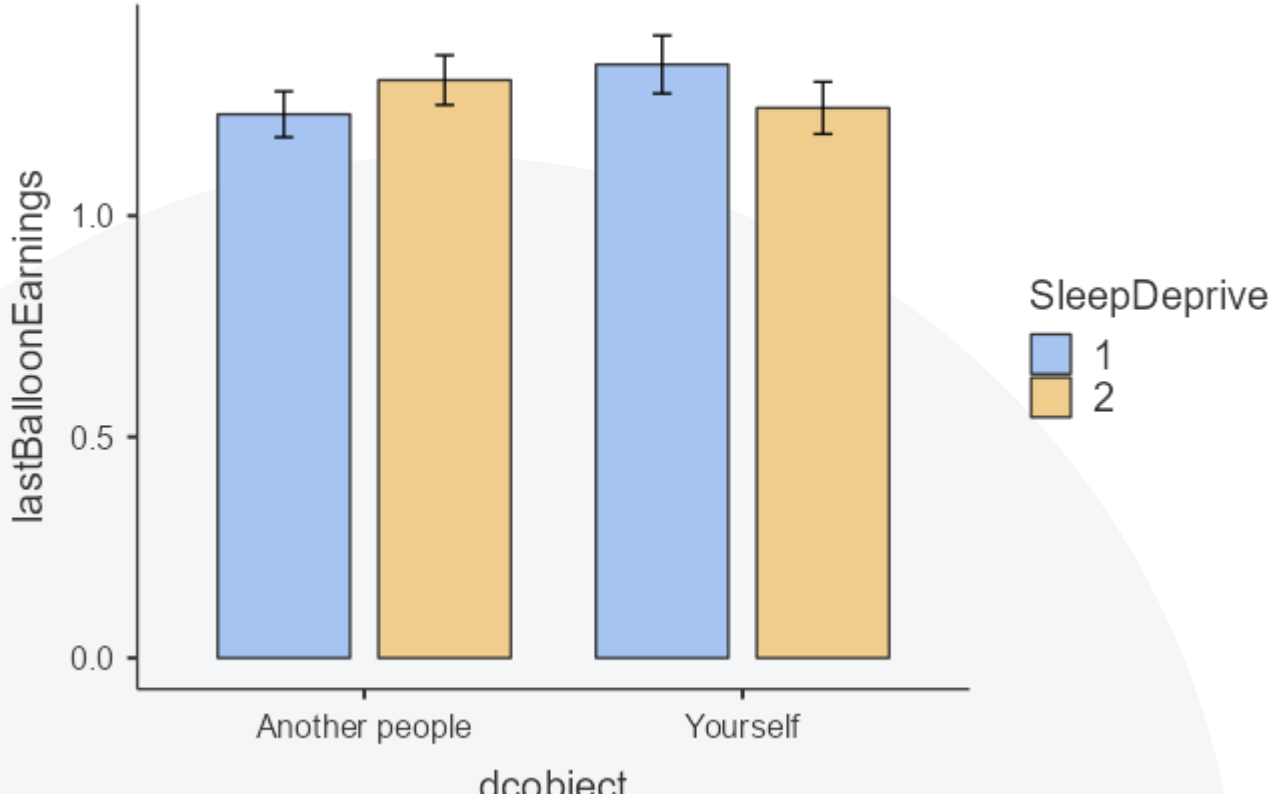
Results

Balloon Analoque Risk Task(BART)

Earning

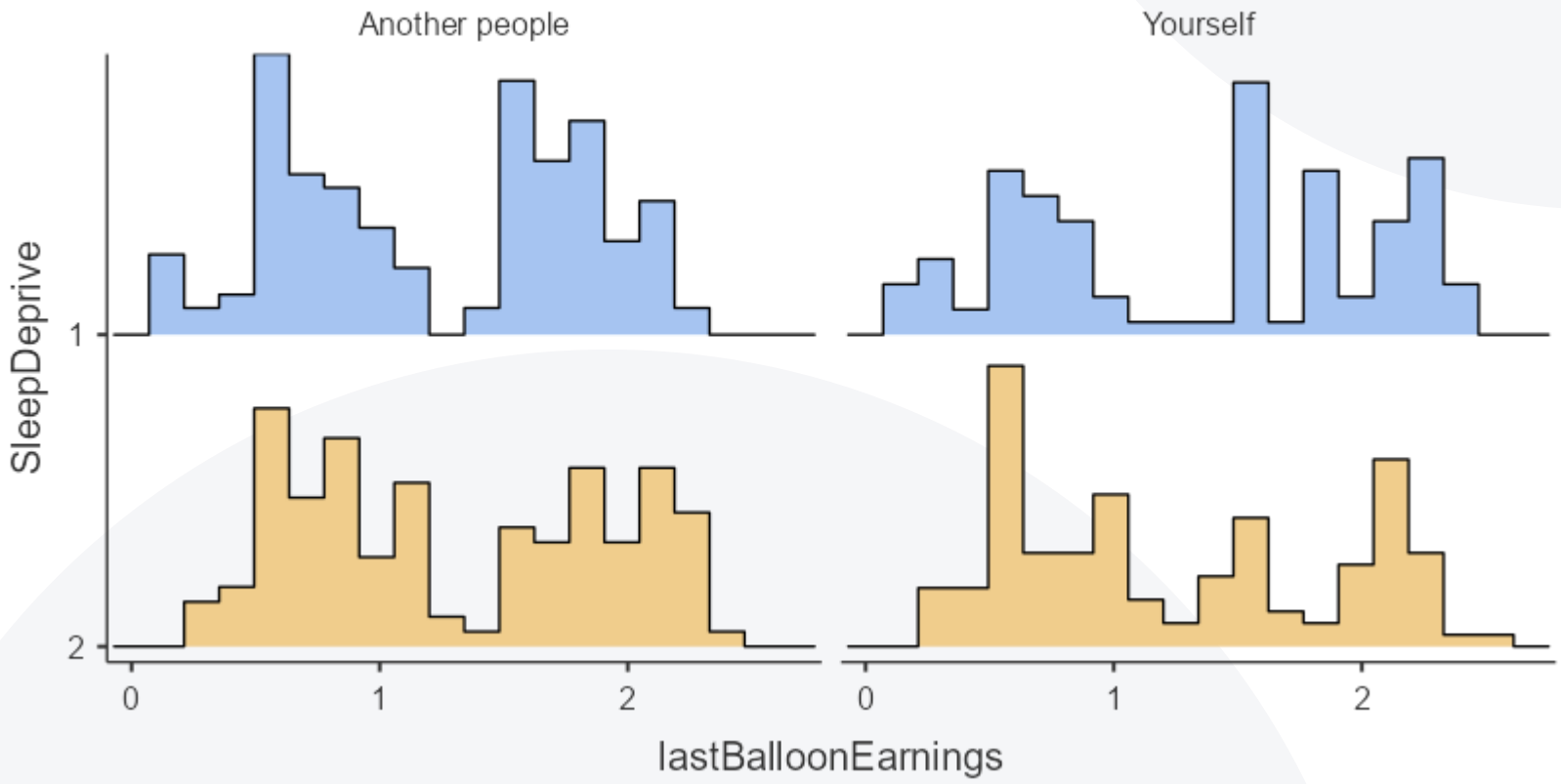
方差分析- lastBalloonEarnings

	平方和	自由度	均方	F值	p值	η^2p
dcobject	0.07659	1	0.07659	0.18321	0.66882	0.00037
SleepDeprive	0.01354	1	0.01354	0.03238	0.85727	0.00007
dcobject ✻ SleepDeprive	0.95761	1	0.95761	2.29066	0.13079	0.00461
残差	206.93532	495	0.41805			



Results

Balloon Analoque Risk Task(BART)



Balloon Analoque Risk Task(BART)

key parameters of the scan

Magnetic Field Strength: 3T

Manufacturer:** Siemens

Manufacturer's Model Name:** Prisma

Acquisition Time: 10:21:34.542500

Repetition Time: 1.5

Flip Angle: 90

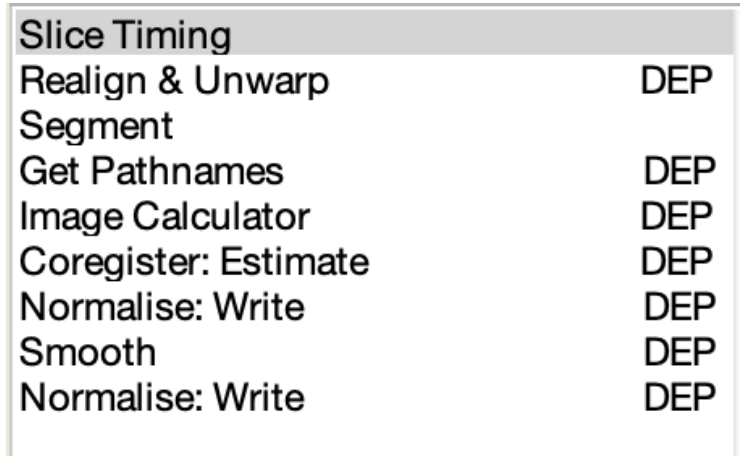
Echo Time:0.03

key parameters of the scan

- Magnetic Field Strength: 3T
- Manufacturer:** Siemens
- Manufacturer's Model Name:** Prisma
- Acquisition Time: 10:21:34.542500
- Repetition Time: 1.5
- Flip Angle: 90
- Echo Time:0.03

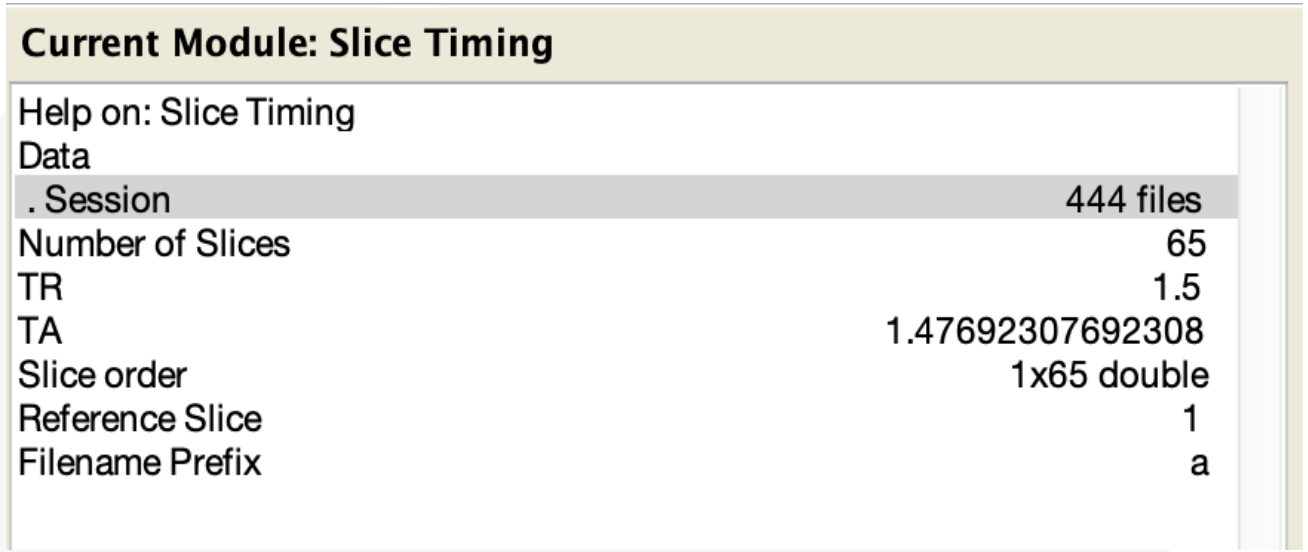
- “Number of slices” = 65
- Slice timing :[1:65]
- “Repetition Time": 1.5,
- TR： 1.5
- TA ： 1.5-1.5/65 = 1.47
- Slice order

SPM12： preprocess



- **Realign & Unwarp:** 对数据进行重新对齐和去畸变处理。
- **Segment:** 将数据分割成不同的组件，可能是脑组织类型。
- **Image Calculator:** 图像计算器，用于执行图像之间的计算操作。
- **Coregister: Estimate:** 核配准，用于将不同成像模态的图像配准到同一空间。
- **Normalise: Write:** 归一化处理，并将结果写入文件。
- **Smooth:** 平滑处理，用于减少图像中的噪声。

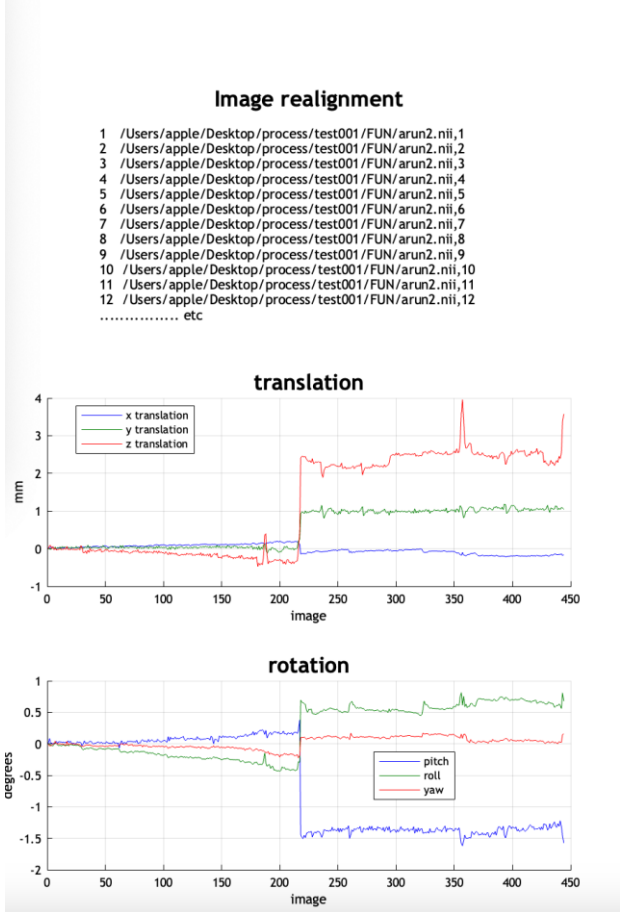
- “Number of slices” = 65
- Slice timing :[1:65]
- “Repetition Time": 1.5,
- TR： 1.5
- TA： 1.5-1.5/65 = 1.47
- Slice order

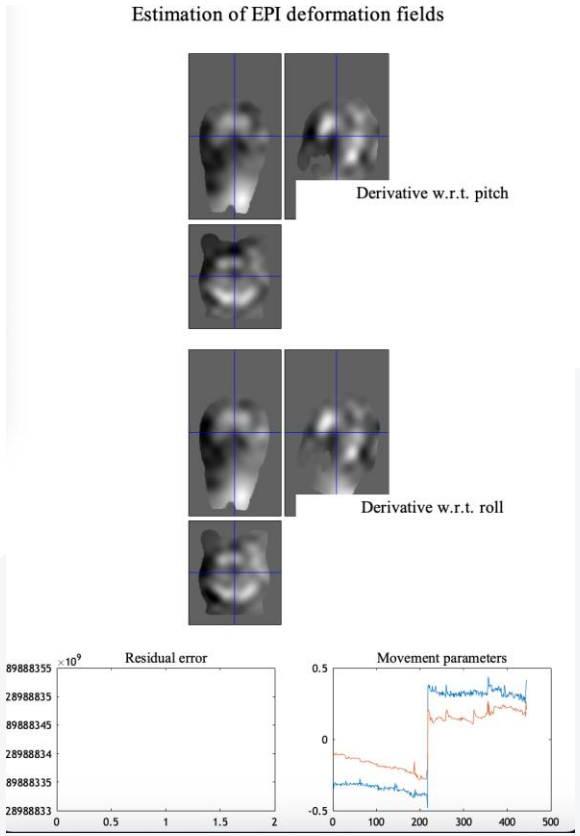


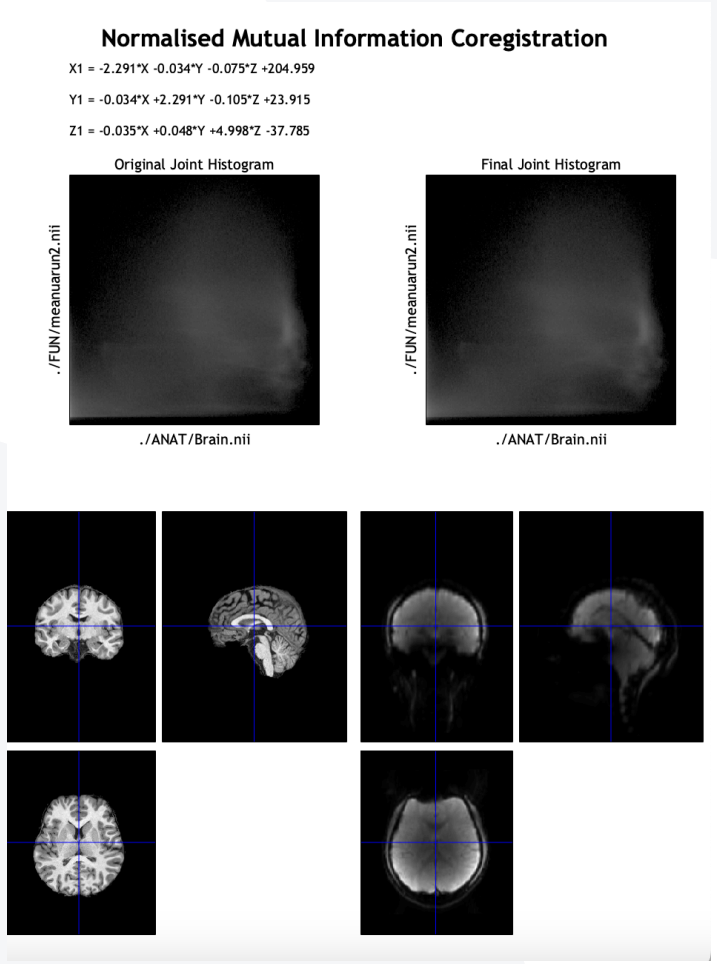
Preprocess

1. **Realign & Unwarp**: 对原始图像进行重新定位（重新对齐），通常用于校正由于头部运动而引起的图像失真，以及去除扭曲（unwarp）。
2. **Segment**: 将结构性MRI图像分成不同的组织类型，例如灰质、白质和脑脊液。
3. **Get Pathnames**: 获取图像文件的路径名。
4. **Image Calculator**: 对图像进行计算操作，可能是对图像进行加减乘除等数学操作。
5. **Coregister: Estimate**: 对不同模态或时间点的图像进行核注册，使它们在相同的空间中对齐。
6. **Normalise: Write**: 将图像标准化到一个标准空间（通常是脑图像处理软件的模板空间）并将结果写入文件。
7. **Smooth**: 对图像进行空间平滑处理，通常用于减小噪音和提高信噪比。
8. **Normalise: Write**: 再次进行标准化处理并将结果写入文件。

Test001-run2_4







First level-

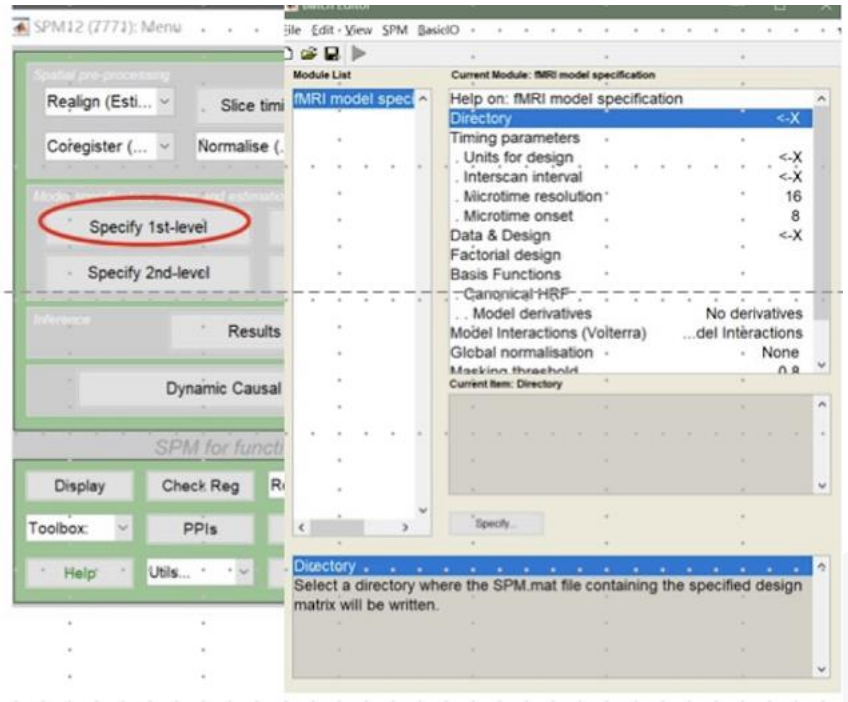
•High-pass temporal filtering with a cut-off of 128 s was applied to remove low-frequency drifts in signal.

对信号进行高通滤波的操作，其截止频率为128秒，以去除信号中的低频漂移。在功能性磁共振成像（fMRI）数据分析中，信号中可能存在与时间相关的低频漂移，这可能是由于呼吸、心跳等生理活动引起的，或者是由于仪器的噪声或系统漂移引起的。高通滤波的目的是去除这些低频成分，以保留高频的神经活动信号，并且提高信号的噪声比。

- **回归器（Regressor）：** 表示在设计矩阵中各个条件下的预期脑活动模式。通常，回归器对应于实验中的不同条件或事件，例如任务刺激的起始时间和持续时间。

- **卷积模型（Convolution Model）：** 将预期的脑活动模式（回归器）与血氧水平依赖信号（BOLD）的响应函数进行卷积，以模拟BOLD信号在时间上的延迟和扩散效应。

First level-1

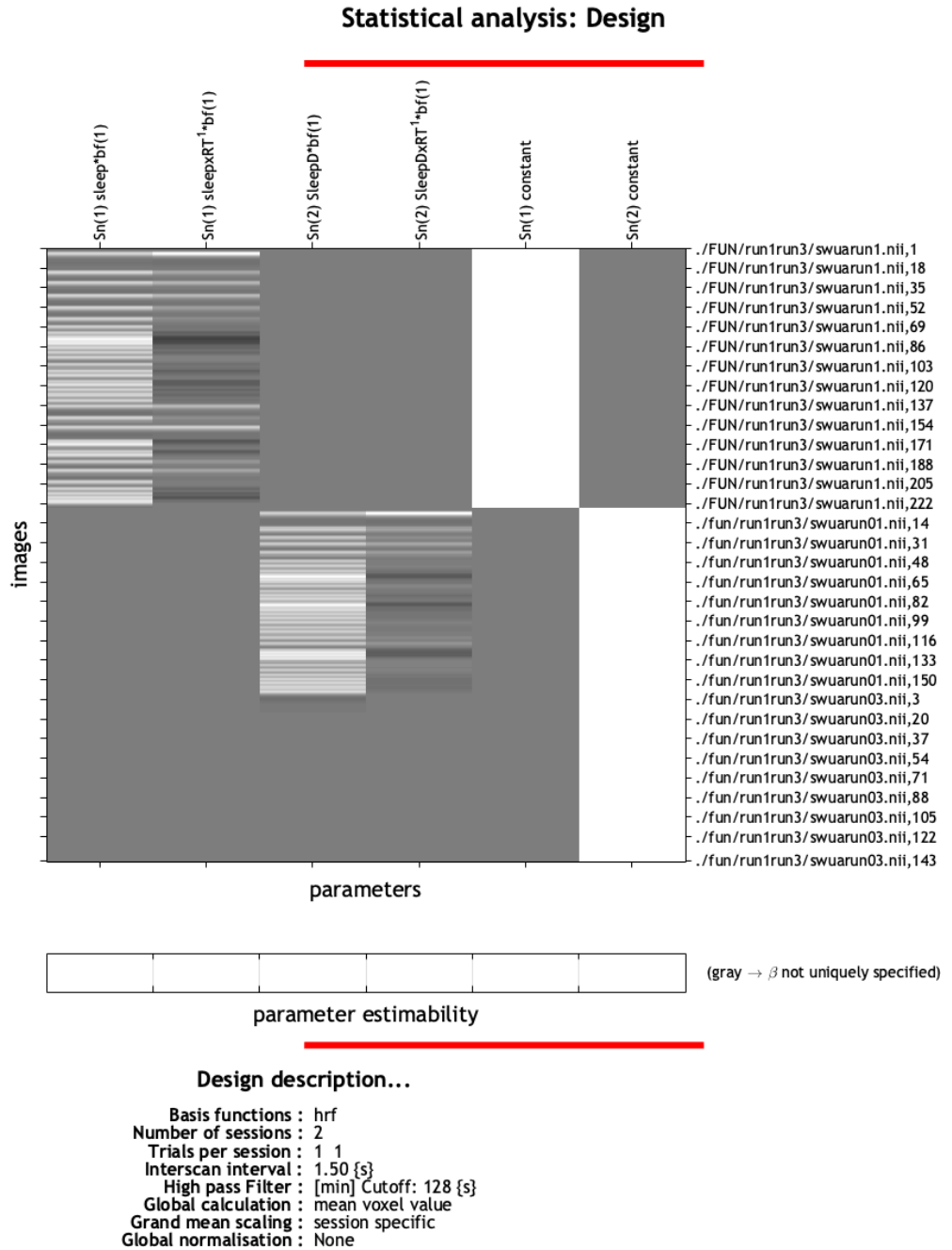


First level-1： condition

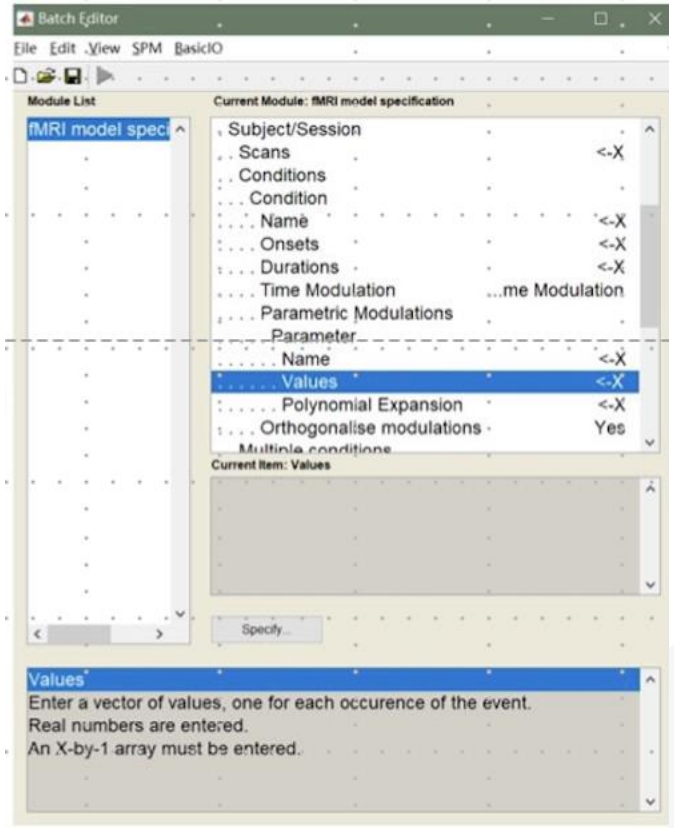
SPM.mat
subject001-run1sleep-d比较.mat

BART image data were modeled using a standard **hemodynamic response function (HRF)** with time derivative

1.参数value 对应condition中onset 此处选择： **RT**
2.更改数据信息麻烦容易出错;
3.建议采取代码方式
4.结果为SPM.mat



First level-2



Preprocessed BART image data were modeled using a standard hemodynamic response function (HRF) with time derivative. For the voxel-wise whole-brain analysis, the model included three regressors representing three events after participants pressed a button: (1) balloon inflation (i.e., the onset of a larger balloon); (2) win outcome (i.e., the onset of the win feedback/collected the wager); (3) loss outcome (i.e., the onset of the loss feedback/balloon exploded). The six head motion parameters were included in the first-level GLM model as a regressor to account for the head motion effects. The probability of explosion for each balloon as the parametric risk level was entered into the model as a linear parametric modulation of the balloon inflation regressor. Specifically, as described in the method section, for each balloon, the maximum inflation they can make was 12. From the 1st pump to the 12th pump, the probability of explosion increased monotonically and specifically ranged from 0% to 89.6%. In the 1st-level GLM, the probability of explo-

GLM： For the voxel-wise whole-brain analysis

$$Y = X\beta + \epsilon$$

•Y represents the observed data, such as brain activity at each time point.

•

•X is the design matrix, containing regressors for each condition and parameter.

•

•β is the parameter vector, representing the coefficients for each regressor.

•

•ϵ is the error term, representing unexplained variability in the model.

- *three conditions 1C1, 2C2, 3C3, and one parameter P, the design matrix X can be represented as:*

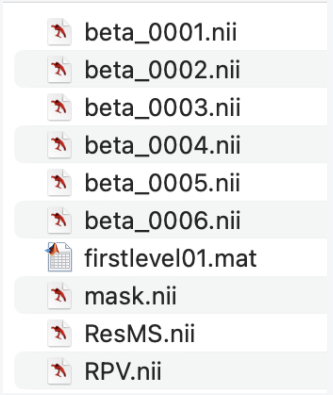
$$X = \begin{bmatrix} C_1 & C_2 & C_3 & P \\ 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

First level-2 GLM: For the voxel-wise whole-brain analysis

- 1. 模型设计:
- - **三个回归器（regressors）**来表示参与者按下按钮后的三个事件:
- (1) 气球充气（即气球的开始）； balloon body started
- (2) 获胜结果（即获胜反馈/收到赌注的开始）；
- (3) 失败结果（即失败反馈/气球爆炸的开始）。
- - 使用**六个头部运动参数**作为第一级广义线性模型（GLM）的回归器，以考虑头部运动效应的影响。
- - 将**每个气球的爆炸概率**作为**参数化的风险水平**输入到模型中，作为气球充气回归器的线性参数调制。爆炸概率在每个气球充气过程中逐渐增加，具体范围从0%到100%。

- Balloon body
- Win<- pomp=false
- Lose pomp=true

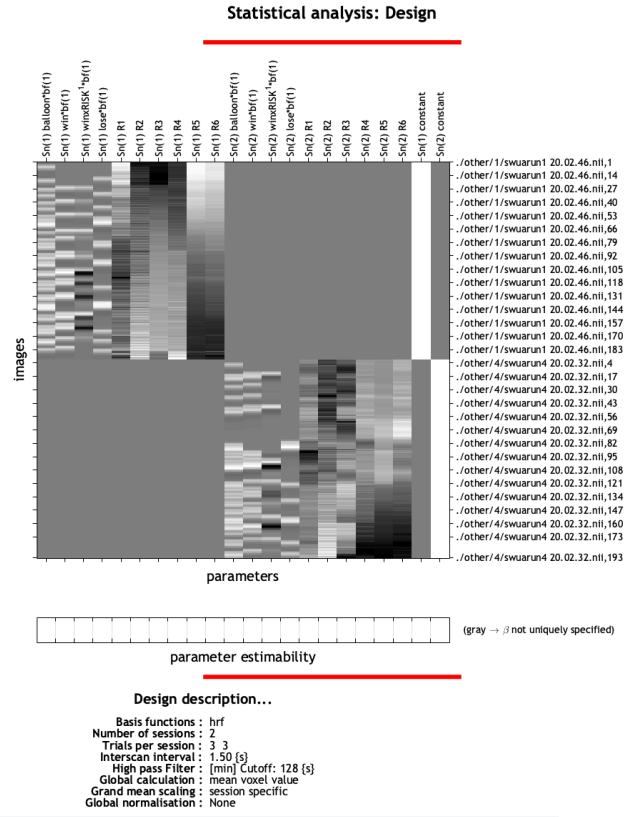
First level-2 Model estimation



- **1. Temporal non-sphericity (时间非球形性)：**
- - 41721个体素的时间非球形性估计。
- - 使用了**ReML（Restricted Maximum Likelihood 受限最大似然）估计方法**
- - 显示了不同迭代次数下的ReML估计值。

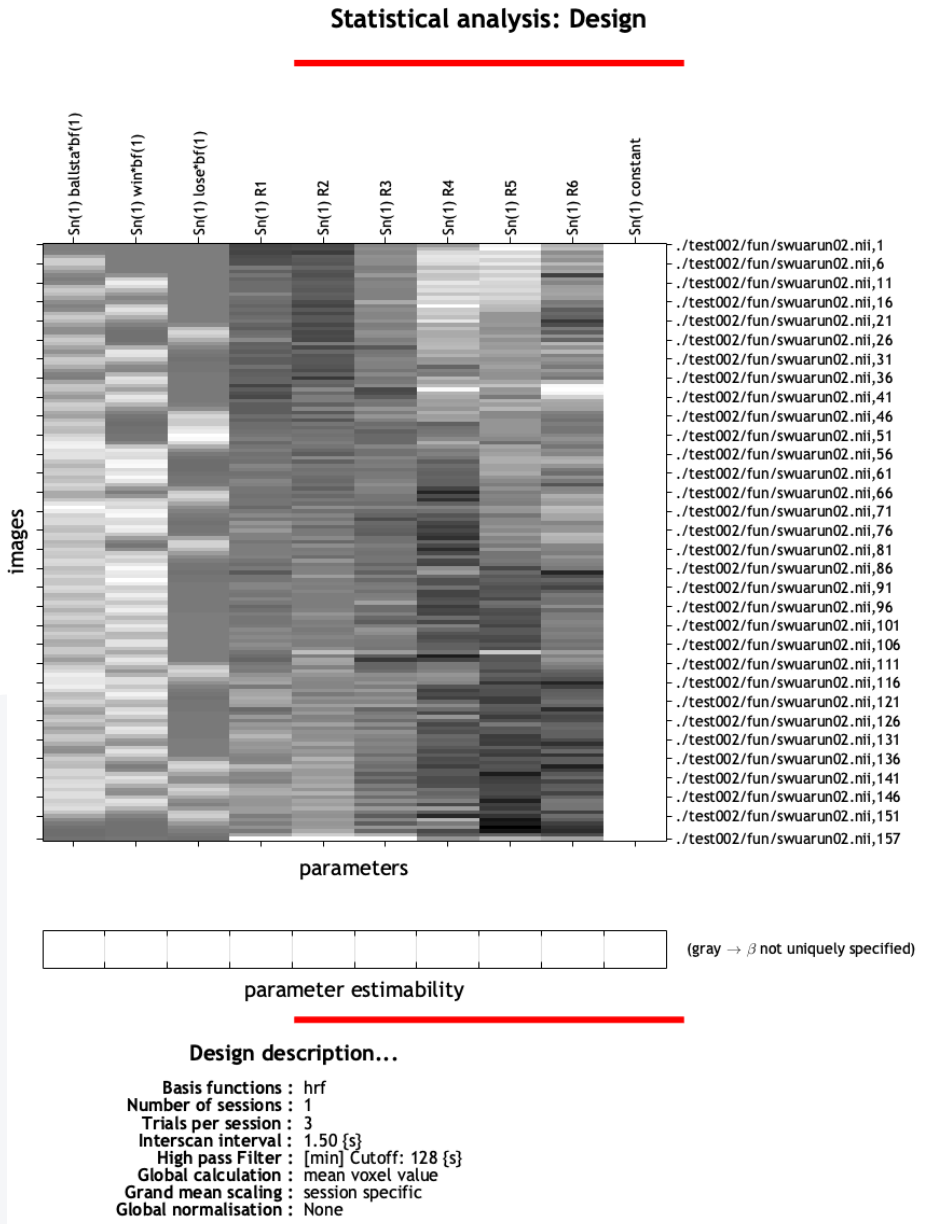
- **2. Spatial non-sphericity (空间非球形性)：**
- - 针对扫描的空间非球形性处理已完成。

- **3. SPM.mat：**
- - SPM.mat文件已保存。

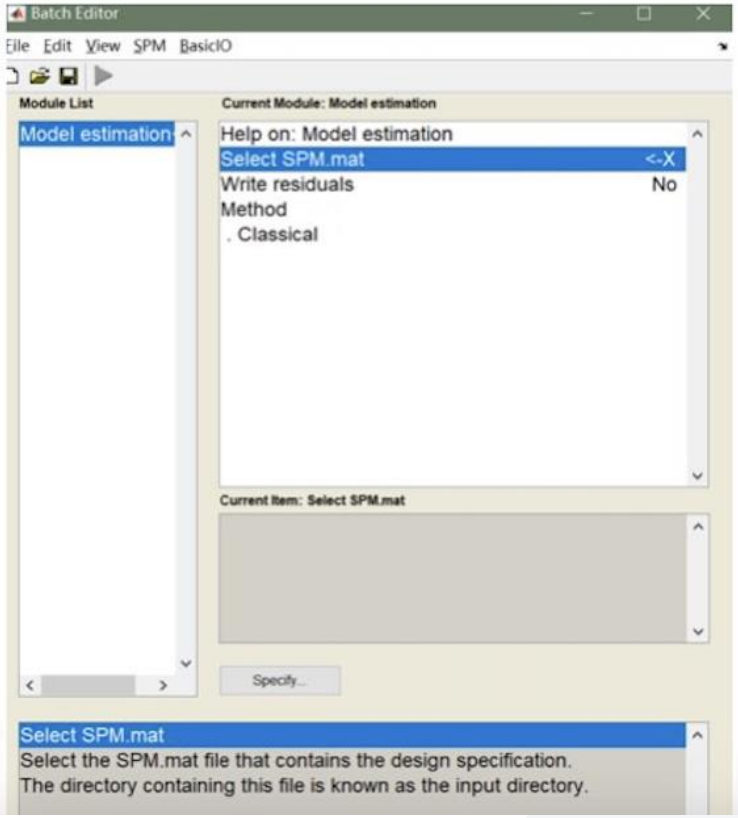


P6 for other sd 单run

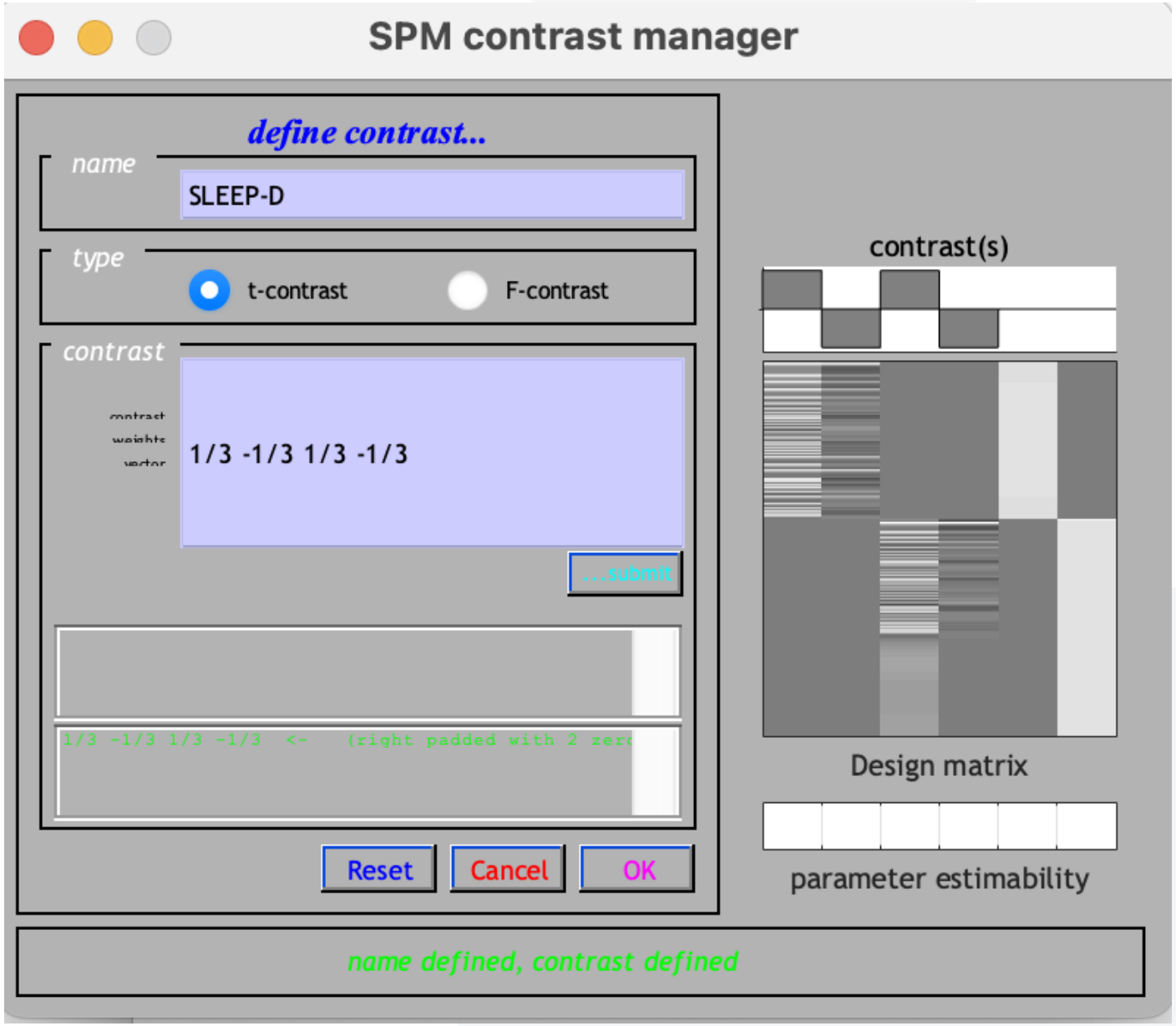
- Balloon body
- Win<- pomp=false
- Lose pomp=true



First level-3



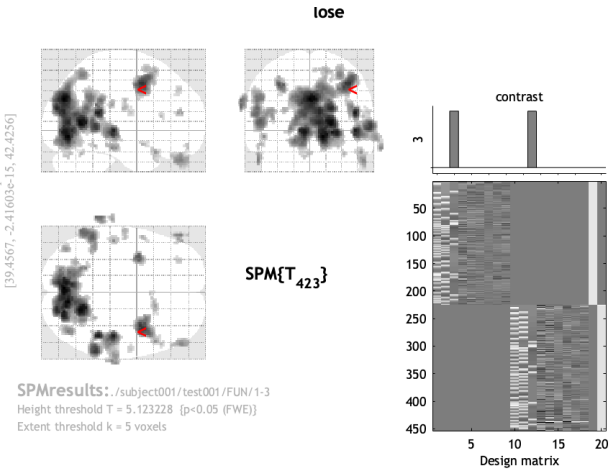
- Estimate:选择Estimate
  - Select SPM.mat：选择上一步生成的SPM.mat文件
  - 其余选项采用默认设置。

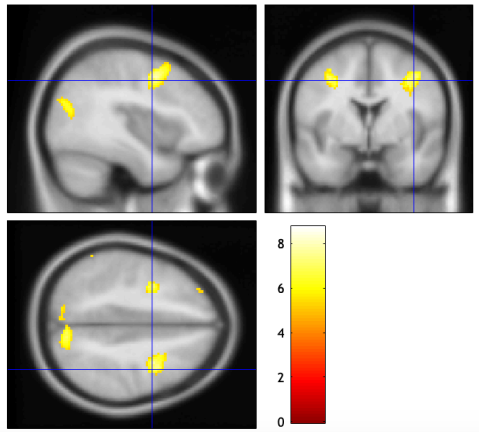


头动信息未参与计算
1/3 -1/3
Beta值x权重

Lose-self-NSD

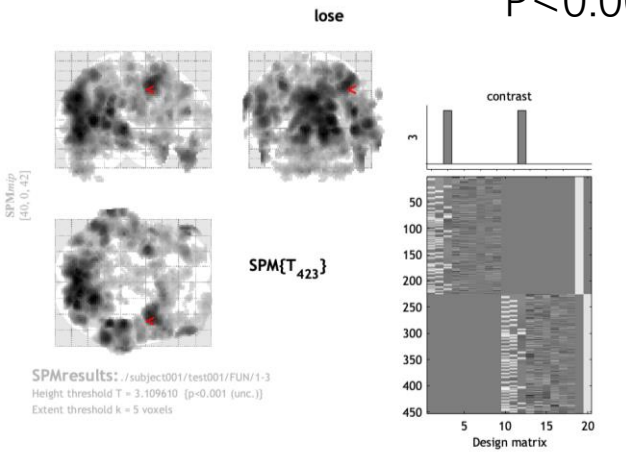
通过矫正FWE < 0.05

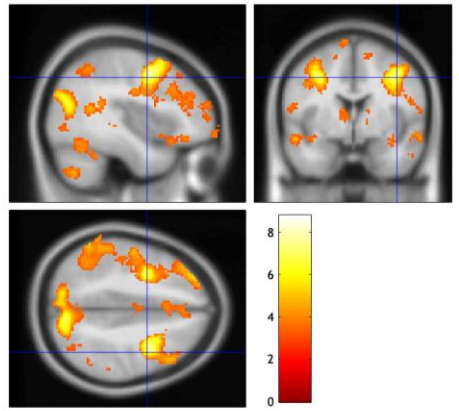


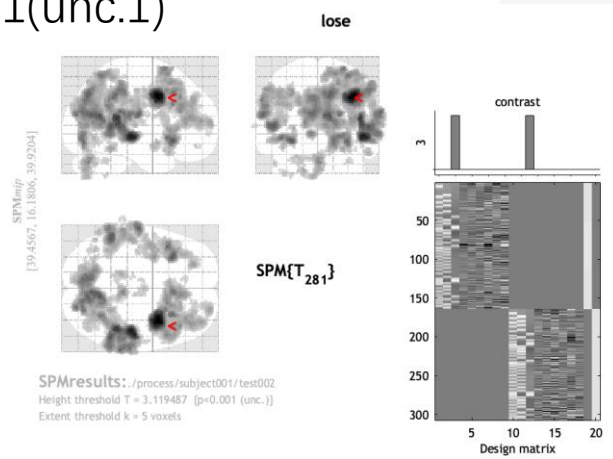


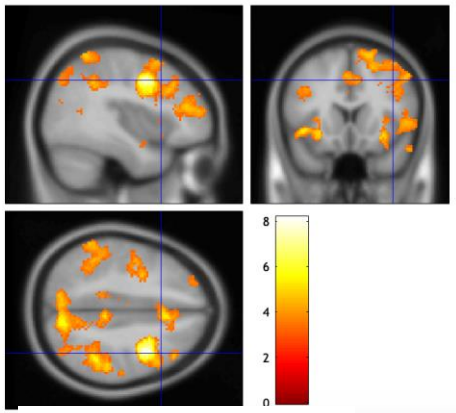
Lose-self-SD

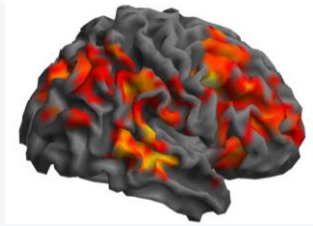
P<0.001(unc.1)



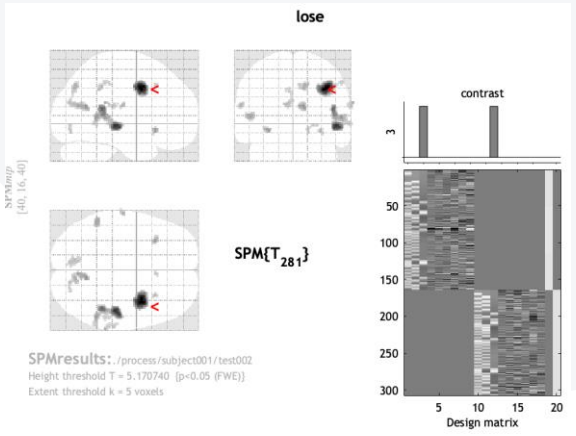


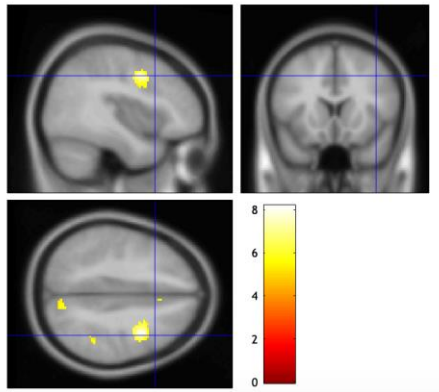




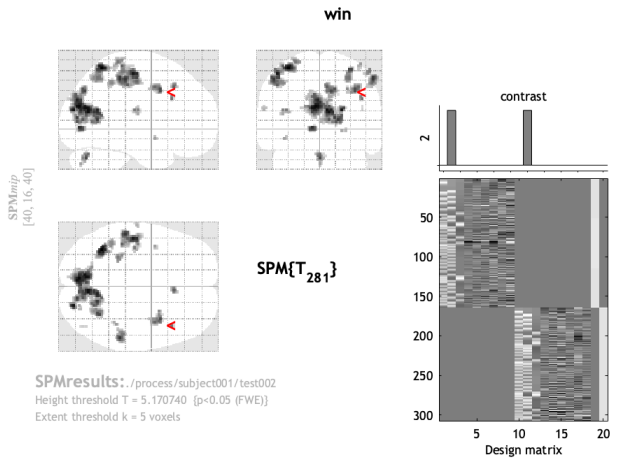


通过矫正FWE < 0.05

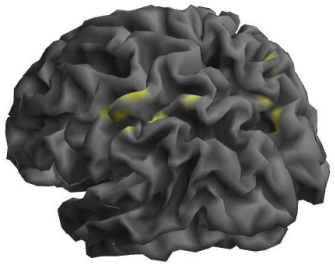


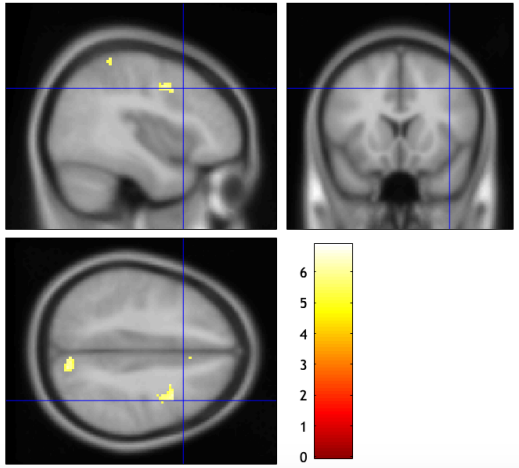


win-self-SD



通过矫正FWE < 0.05





Statistics: *p-values adjusted for search volume*

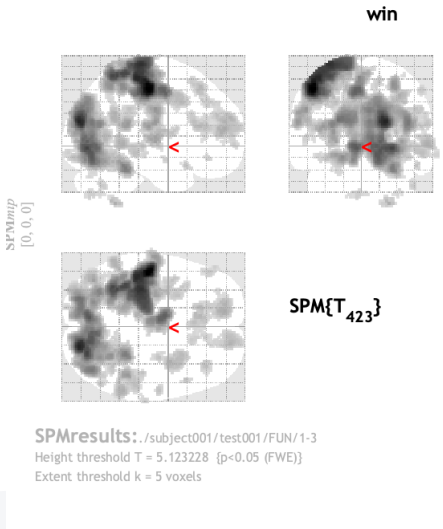
set-level		cluster-level				peak-level					mm mm mm		
p	c	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	T	(Z_E)	p_{uncorr}			
0.000	18	0.000	0.000	93	0.000	0.000	0.012	6.88	6.61	0.000	-36	-56	62
		0.000	0.000	987	0.000	0.000	0.012	6.79	6.53	0.000	-6	-80	22
						0.000	0.012	6.73	6.47	0.000	8	-70	16
						0.000	0.012	6.71	6.46	0.000	-8	-72	20
		0.000	0.000	287	0.000	0.000	0.012	6.65	6.41	0.000	-48	-22	56
						0.000	0.018	6.42	6.20	0.000	-52	-30	50
						0.000	0.039	6.09	5.90	0.000	-42	-34	64
		0.000	0.000	39	0.000	0.000	0.015	6.49	6.26	0.000	-10	-80	0
		0.000	0.000	94	0.000	0.000	0.018	6.43	6.21	0.000	56	-36	50
						0.001	0.065	5.95	5.77	0.000	52	-34	58
		0.000	0.000	109	0.000	0.000	0.023	6.29	6.08	0.000	32	-58	60
						0.001	0.065	5.96	5.78	0.000	30	-60	52
		0.000	0.000	39	0.000	0.000	0.023	6.28	6.07	0.000	-2	-72	-32
						0.005	0.228	5.61	5.46	0.000	-2	-78	-38
		0.000	0.000	90	0.000	0.000	0.024	6.27	6.06	0.000	36	8	40
						0.002	0.122	5.77	5.61	0.000	28	6	40
						0.016	0.484	5.40	5.26	0.000	36	-4	40
		0.000	0.000	17	0.000	0.000	0.036	6.13	5.93	0.000	6	22	42
		0.000	0.013	8	0.005	0.001	0.063	5.97	5.79	0.000	44	20	30
		0.000	0.000	28	0.000	0.001	0.065	5.95	5.77	0.000	-28	-38	68
						0.015	0.467	5.41	5.27	0.000	-32	-32	72
		0.000	0.000	21	0.000	0.001	0.079	5.90	5.72	0.000	-38	-20	18
		0.000	0.000	31	0.000	0.002	0.103	5.83	5.66	0.000	-42	-44	46
		0.000	0.006	10	0.002	0.004	0.186	5.67	5.51	0.000	42	-40	66
		0.001	0.043	5	0.021	0.005	0.214	5.63	5.48	0.000	-40	2	-12
		0.001	0.030	6	0.013	0.007	0.262	5.57	5.42	0.000	22	-80	-4
		0.000	0.013	8	0.005	0.010	0.337	5.50	5.36	0.000	-62	-18	18
		0.001	0.043	5	0.021	0.025	0.628	5.31	5.18	0.000	44	-76	18

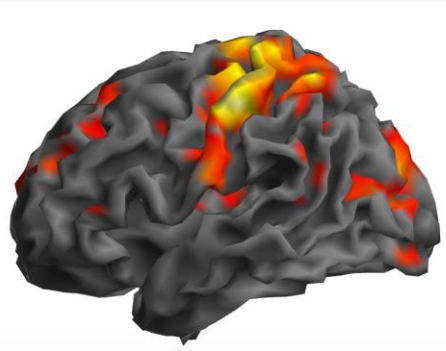
table shows 3 local maxima more than 8.0mm apart

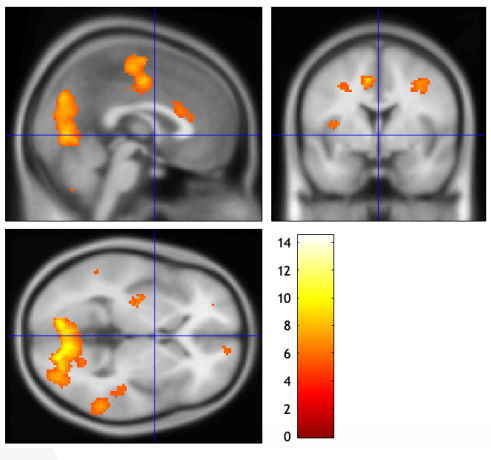
Height threshold: T = 5.17, p = 0.000 (0.050)
Extent threshold: k = 5 voxels, p = 0.021 (0.001)
Expected voxels per cluster, <k> = 0.876
Expected number of clusters, <c> = 0.00
FWEp: 5.171, FDRp: 6.046, FWEc: 1, FDRc: 5

Degrees of freedom = [1.0, 281.0]
FWHM = 6.6 6.7 6.4 mm mm mm; 3.3 3.3 3.2 {voxels}
Volume: 1803576 = 225447 voxels = 5860.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 35.25 voxels)

win-self-nSD







Statistics: *p-values adjusted for search volume*

set-level		cluster-level				peak-level					mm mm mm		
p	c	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	T	(Z_E)	p_{uncorr}			
0.000	33	0.000	0.000	7209	0.000	0.000	0.000	14.50	Inf	0.000	-48	-20	50
						0.000	0.000	12.59	Inf	0.000	-44	-30	60
						0.000	0.000	12.23	Inf	0.000	-32	-28	72
		0.000	0.000	9704	0.000	0.000	0.000	12.73	Inf	0.000	20	-86	20
						0.000	0.000	11.41	Inf	0.000	26	-78	-4
						0.000	0.000	10.72	Inf	0.000	16	-76	-6
		0.000	0.000	234	0.000	0.000	0.000	8.28	Inf	0.000	28	-56	54
		0.000	0.000	788	0.000	0.000	0.000	8.04	7.75	0.000	46	-40	18
						0.000	0.000	7.14	6.93	0.000	60	-44	0
						0.000	0.002	6.58	6.41	0.000	54	-34	-8
		0.000	0.000	1034	0.000	0.000	0.000	7.30	7.08	0.000	-12	52	14
						0.000	0.000	7.00	6.81	0.000	-18	52	20
						0.000	0.000	6.85	6.67	0.000	-8	28	16
		0.000	0.000	367	0.000	0.000	0.000	7.17	6.96	0.000	34	0	44
						0.000	0.001	6.69	6.52	0.000	28	10	40
						0.000	0.001	6.68	6.51	0.000	36	8	44
		0.000	0.000	79	0.000	0.000	0.000	7.11	6.90	0.000	24	-52	-54
		0.000	0.000	248	0.000	0.000	0.000	6.99	6.80	0.000	-54	-52	22
						0.000	0.007	6.30	6.15	0.000	-58	-52	32
						0.000	0.016	6.12	5.99	0.000	-46	-46	18
		0.000	0.000	488	0.000	0.000	0.000	6.95	6.76	0.000	18	56	24
						0.000	0.002	6.57	6.41	0.000	12	56	14
						0.000	0.007	6.30	6.16	0.000	16	64	14
		0.000	0.000	61	0.000	0.000	0.002	6.52	6.36	0.000	-34	-90	-12
		0.000	0.000	75	0.000	0.000	0.003	6.48	6.33	0.000	38	34	16
						0.038	0.806	5.18	5.09	0.000	46	34	22
		0.000	0.000	54	0.000	0.000	0.005	6.38	6.23	0.000	60	-10	18
		0.000	0.000	51	0.000	0.000	0.006	6.33	6.18	0.000	30	-10	12

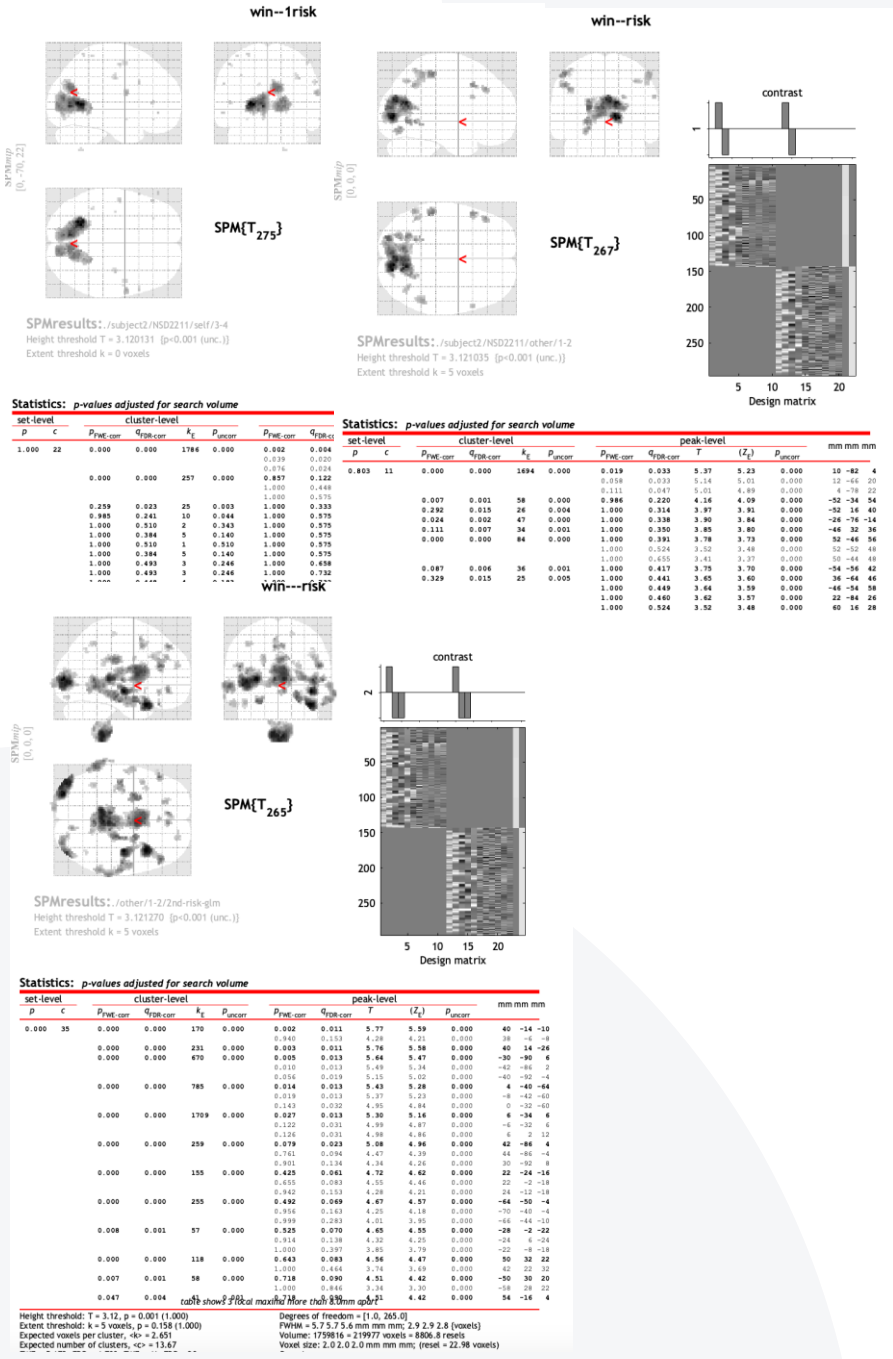
table shows 3 local maxima more than 8.0mm apart

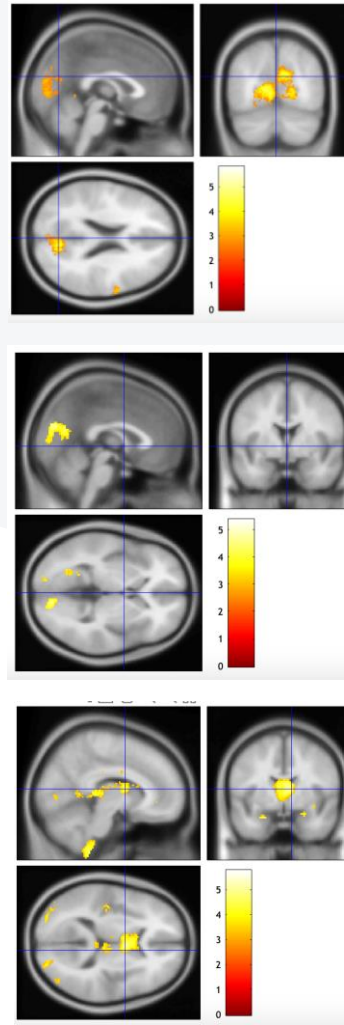
Height threshold: T = 5.12, p = 0.000 (0.050)
Extent threshold: k = 5 voxels, p = 0.022 (0.001)
Expected voxels per cluster, <k> = 0.891
Expected number of clusters, <c> = 0.00
FWEp: 5.123, FDRp: 5.867, FWEc: 1, FDRc: 5

Degrees of freedom = [1.0, 423.0]
FWHM = 6.6 6.6 6.4 mm mm mm; 3.3 3.3 3.2 {voxels}
Volume: 1748832 = 218604 voxels = 5724.2 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 34.93 voxels)
Page 1

如何更好的定义risk?

- **Win risk**
- 1 -1
- win 1st-risk 2nd-risk
  1 -1 -1





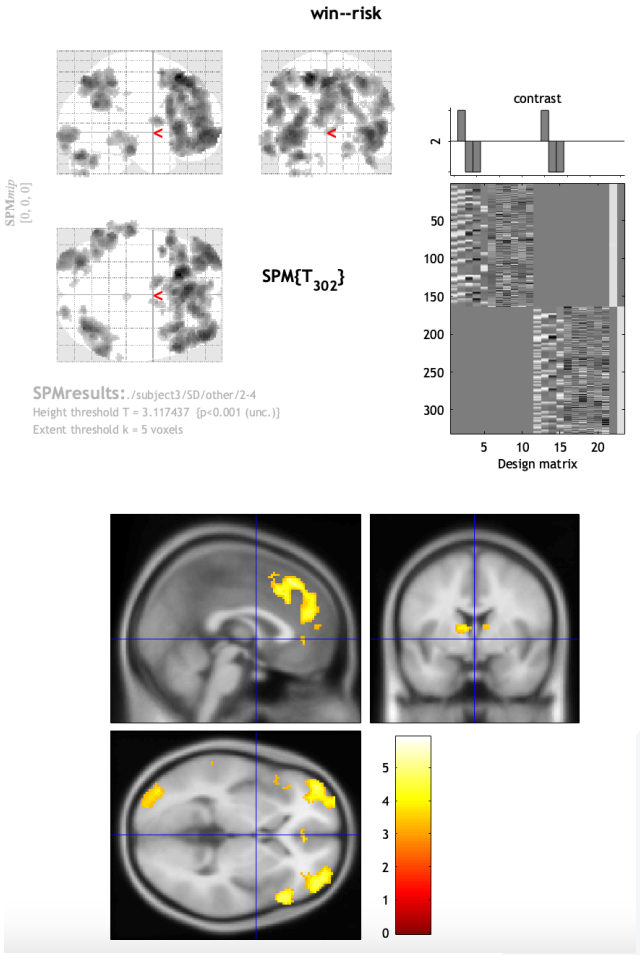
win event as 1 and include **the explosion probability as a parameter in the model with a coefficient of -1,** model will represent the following relationships:

Effect of the win event on brain activation: A coefficient of 1 indicates that the occurrence of the win event has a positive impact on brain activation, meaning that the win event is positively correlated with activation.

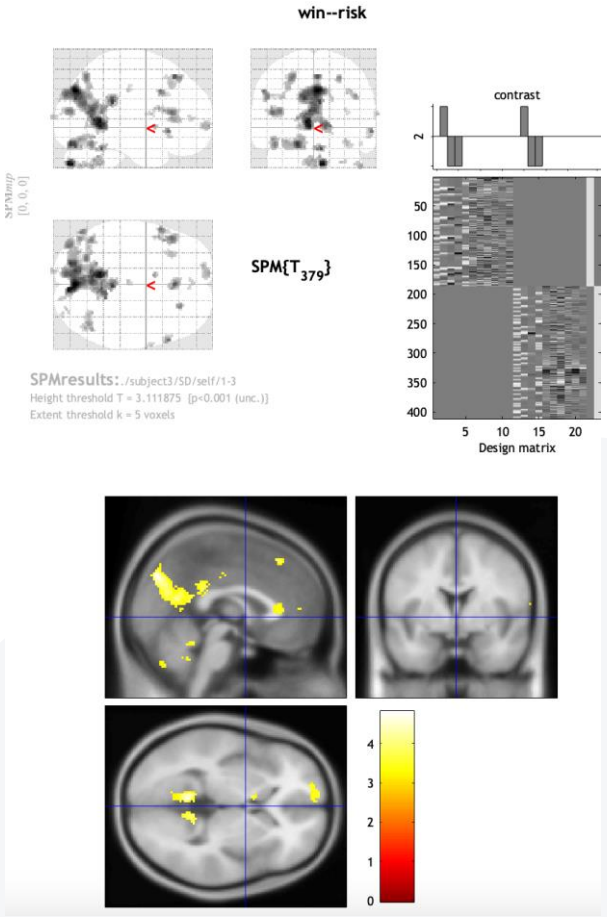
A coefficient of -1 indicates that the explosion probability has a negative impact on the occurrence of the win event.

Subject3 win 1st-risk 2nd-risk 1 -1 -1

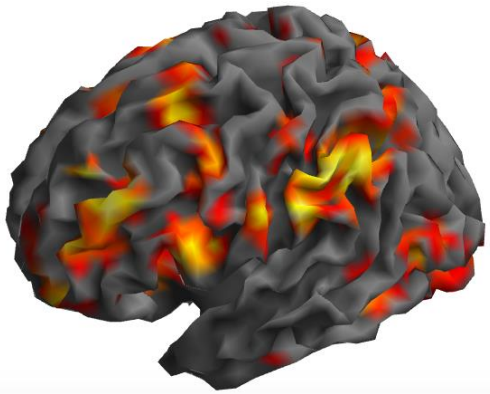
sd-others

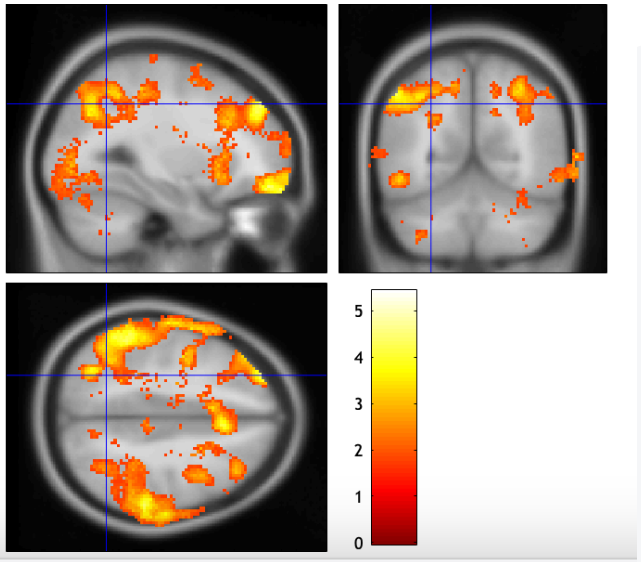


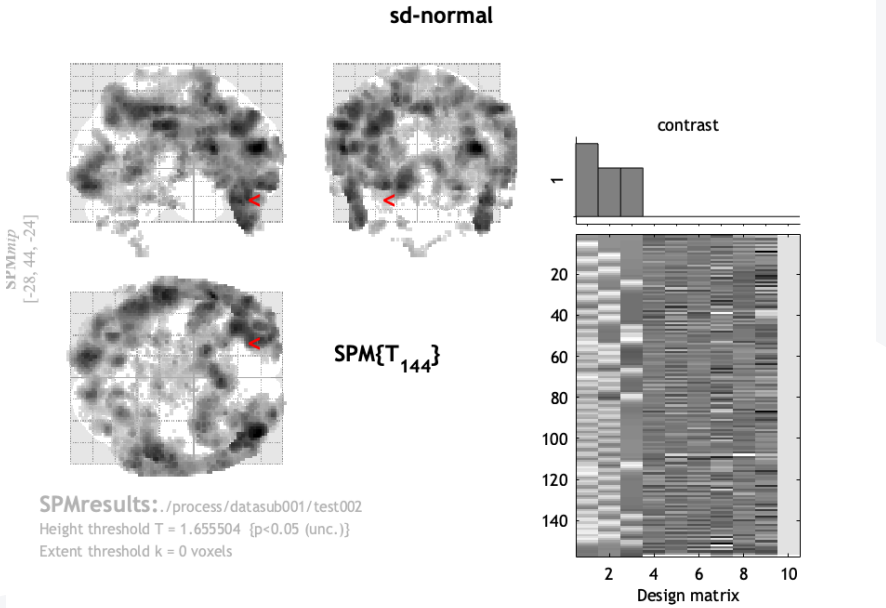
sd-self



Unc 0.05





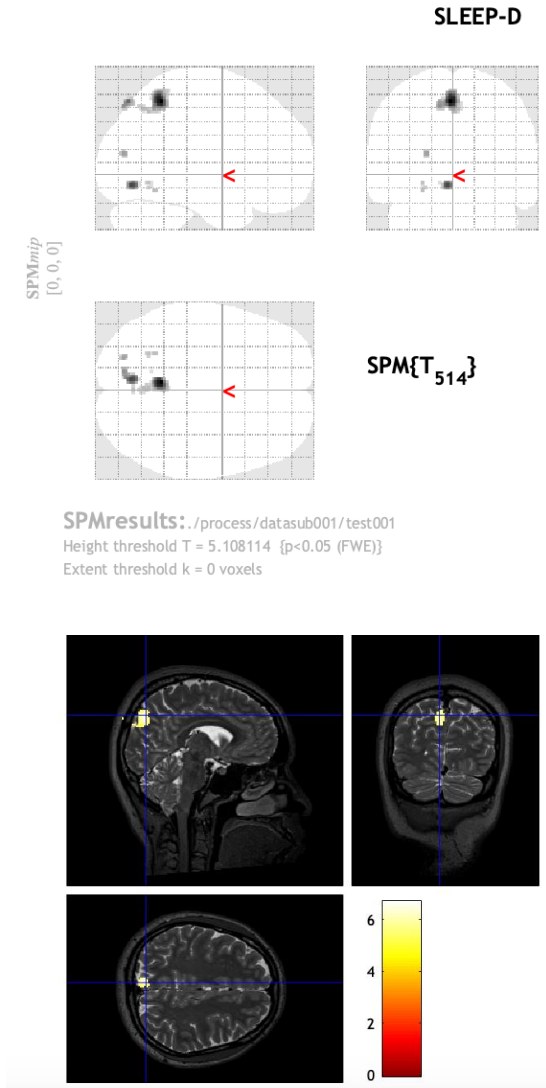


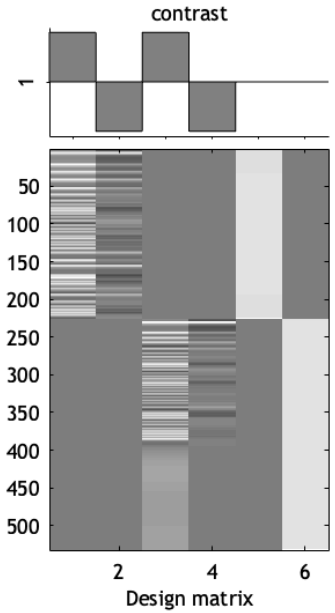
Statistics: *p-values adjusted for search volume*

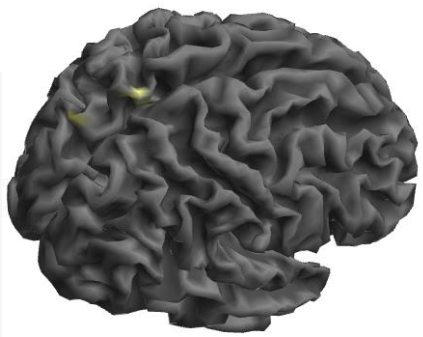
set-level		cluster-level				peak-level					mm mm mm		
p	*c*	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	*T*	(Z_E)	p_{uncorr}			
1.000	197	0.000	0.000	38431	0.000	0.027	0.083	5.43	5.17	0.000	46	50	14
						0.149	0.177	5.04	4.83	0.000	-62	14	14
						0.253	0.177	4.89	4.69	0.000	-62	-26	32
		0.999	0.892	220	0.015	1.000	0.492	3.53	3.45	0.000	42	-72	12
		1.000	0.892	126	0.056	1.000	0.709	3.13	3.07	0.001	70	-18	-32
						1.000	1.000	2.53	2.50	0.006	58	-26	-30
						1.000	1.000	2.28	2.26	0.012	54	-20	-24
		1.000	0.892	93	0.095	1.000	0.866	2.93	2.89	0.002	44	-42	16
						1.000	1.000	1.80	1.80	0.036	46	-48	6
		1.000	0.892	38	0.274	1.000	0.910	2.87	2.82	0.002	-16	-78	-46
						1.000	1.000	2.33	2.30	0.011	-16	-72	-40
						1.000	1.000	1.79	1.79	0.037	-8	-80	-50
		1.000	0.892	93	0.095	1.000	0.959	2.79	2.75	0.003	-32	-50	-46
						1.000	1.000	2.59	2.55	0.005	-36	-60	-46
		1.000	0.892	40	0.262	1.000	0.997	2.75	2.71	0.003	8	-8	44
						1.000	1.000	2.36	2.33	0.010	12	0	46
		1.000	0.892	32	0.315	1.000	1.000	2.67	2.63	0.004	-50	-62	-34
		1.000	0.892	21	0.418	1.000	1.000	2.66	2.63	0.004	-18	-10	2
		1.000	0.892	50	0.211	1.000	1.000	2.62	2.58	0.005	-72	-28	-18
						1.000	1.000	1.93	1.92	0.027	-66	-32	-14
		1.000	0.892	124	0.058	1.000	1.000	2.60	2.57	0.005	-68	-54	10
						1.000	1.000	2.19	2.17	0.015	-62	-50	6
						1.000	1.000	1.89	1.88	0.030	-68	-62	4
		1.000	0.892	101	0.083	1.000	1.000	2.57	2.53	0.006	-12	-48	-62
						1.000	1.000	2.41	2.39	0.008	-6	-46	-70
						1.000	1.000	2.41	2.39	0.008	8	-50	-62
		1.000	0.892	48	0.220	1.000	1.000	2.54	2.51	0.006	-6	-46	74
		1.000	0.892	31	0.323	1.000	1.000	2.54	2.50	0.006	-4	-44	-12
		1.000	0.892	48	0.220	1.000	1.000	2.49	2.46	0.007	52	-14	30

table shows 3 local maxima more than 8.0mm apart

sub001 sleep-d







Statistics: *p-values adjusted for search volume*

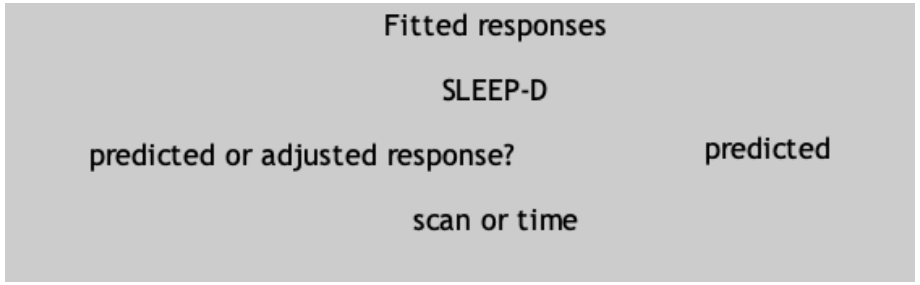
set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	T	(Z_E)	p_{uncorr}	
0.000	8	0.000	0.000	183	0.000	0.000	0.004	6.69	6.55	0.000	-4 -50 54
						0.013	0.516	5.38	5.30	0.000	0 -64 48
		0.000	0.000	37	0.000	0.000	0.043	6.14	6.03	0.000	-6 -74 -10
		0.000	0.000	38	0.000	0.001	0.086	5.93	5.83	0.000	-6 -76 54
						0.003	0.219	5.65	5.56	0.000	-12 -80 50
						0.018	0.516	5.31	5.23	0.000	2 -72 52
		0.000	0.005	11	0.002	0.005	0.307	5.54	5.46	0.000	-22 -80 14
		0.007	0.189	2	0.142	0.015	0.516	5.34	5.27	0.000	-26 -56 -14
		0.002	0.072	4	0.045	0.017	0.516	5.32	5.24	0.000	-26 -60 -8
		0.015	0.292	1	0.292	0.028	0.649	5.22	5.15	0.000	-24 -60 -12
		0.015	0.292	1	0.292	0.048	0.960	5.12	5.05	0.000	-12 -58 -8

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 5.11, p = 0.000 (0.050)
Extent threshold: k = 0 voxels
Expected voxels per cluster, <k> = 0.974
Expected number of clusters, <c> = 0.05
FWEp: 5.108, FDRp: 6.141, FWEc: 1, FDRc: 11

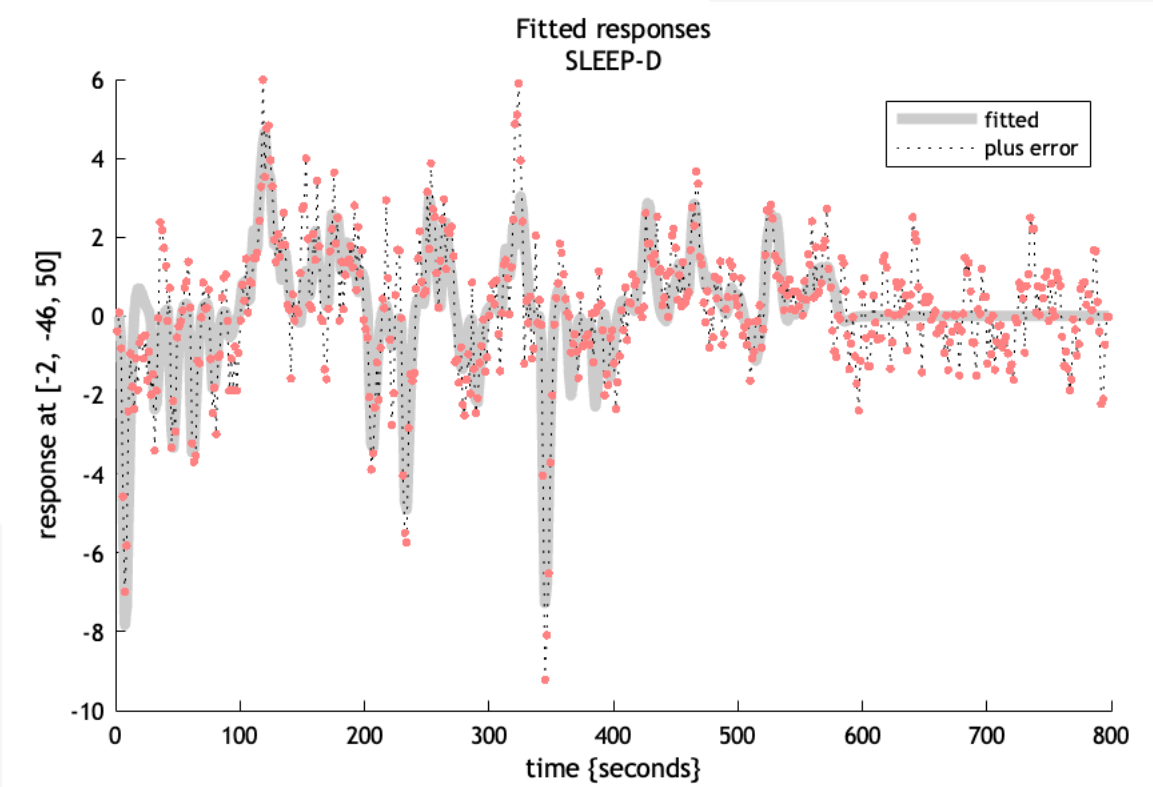
Degrees of freedom = [1.0, 514.0]
FWHM = 6.8 6.8 6.6 mm mm mm; 3.4 3.4 3.3 {voxels}
Volume: 1741680 = 217710 voxels = 5266.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 37.83 voxels)

sub001 sleep-d



粉色是真实的
灰色的预测的曲线
生成t检验文件

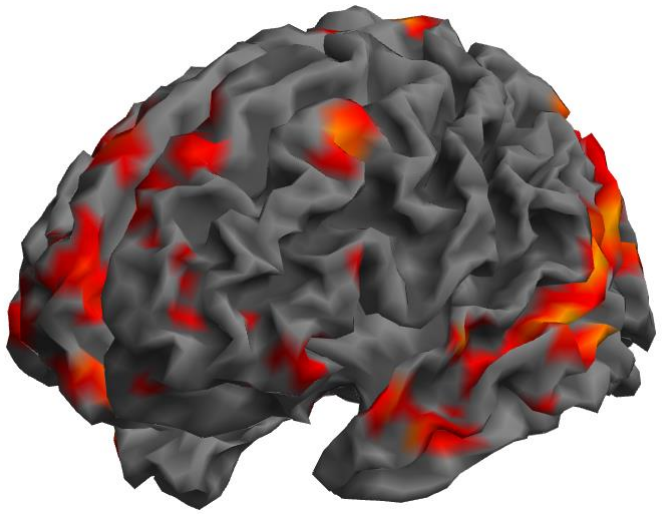
spmT_0001.nii

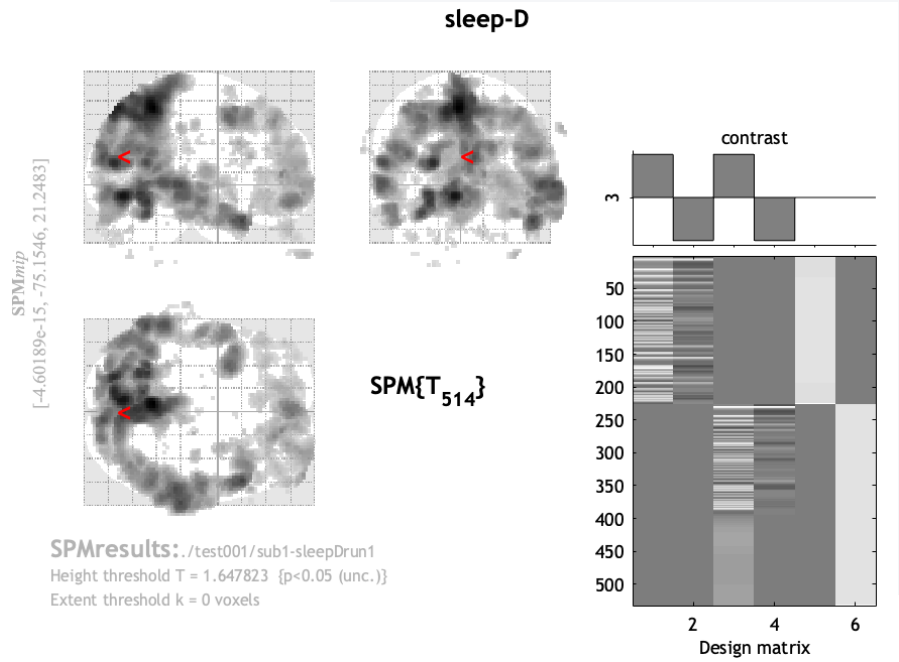


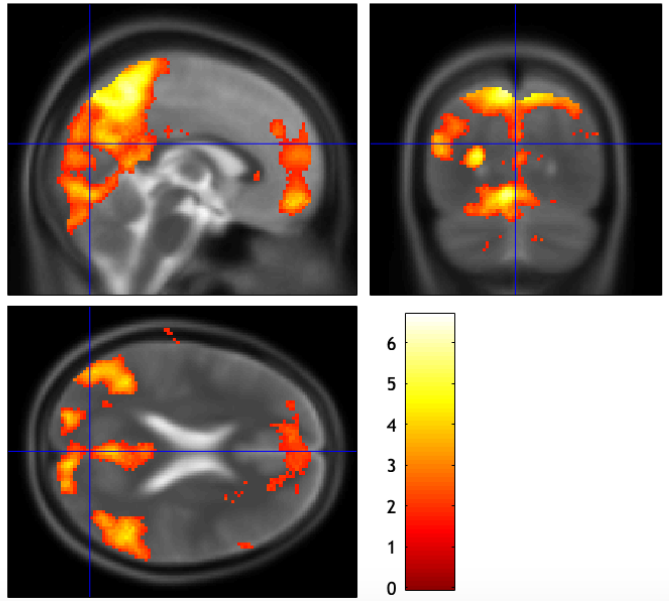
sub001 sleep-d

GLM系数：SD-Normal 1/2 -1/2
T test
设置了整个脑部水平的阈值为未校正的p < .001
OVERLAP

- T1映射
- 皮层表面映射







Whole brain

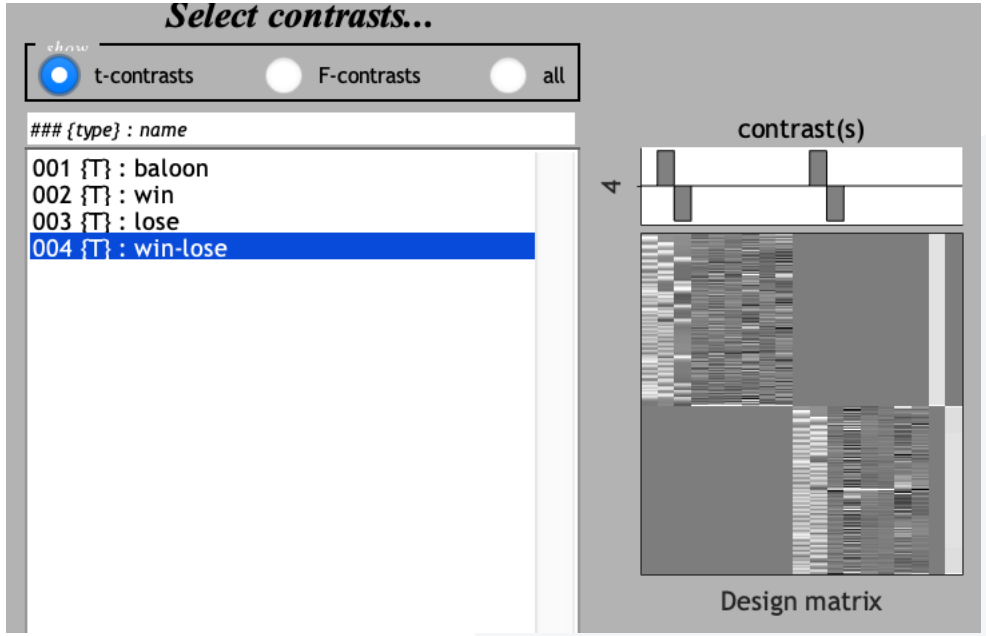
Statistics: *p-values adjusted for search volume*

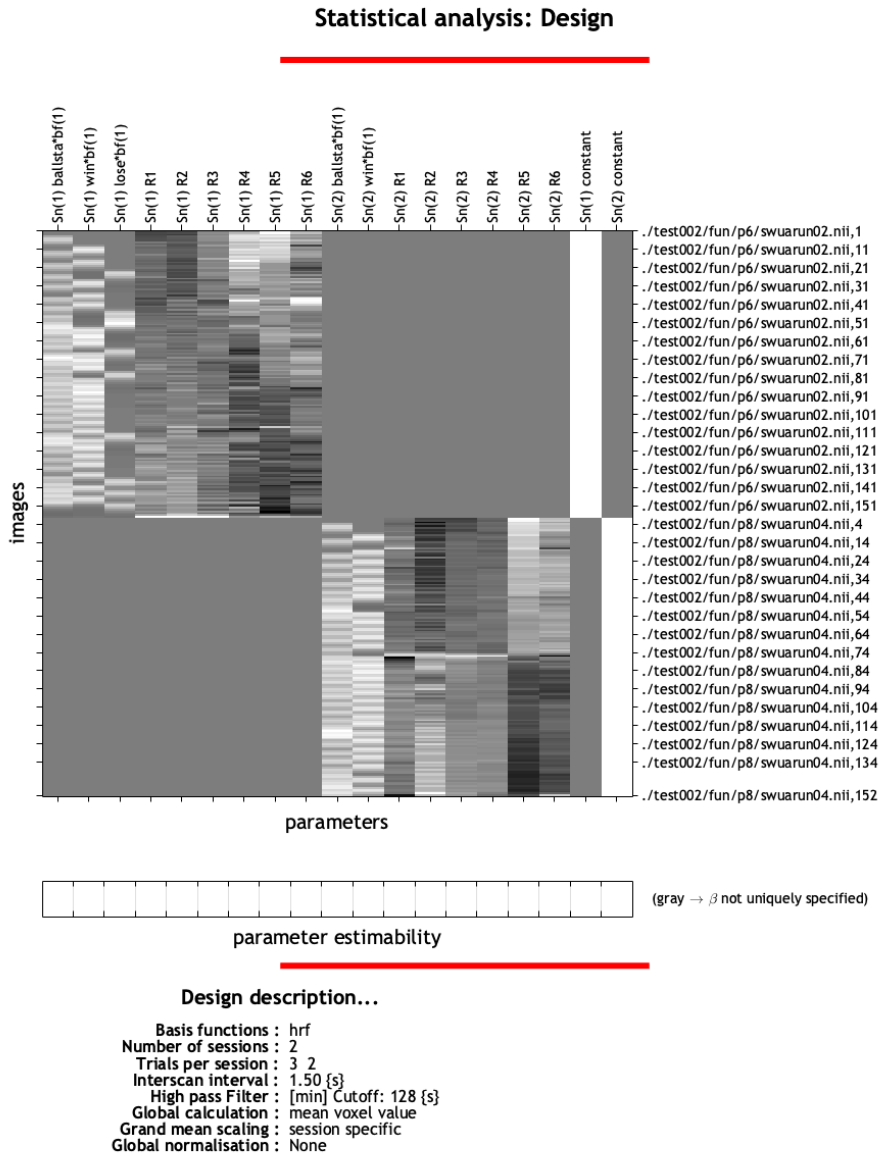
set-level		cluster-level				peak-level					mm	mm	mm
p	c	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	T	(Z_E)	p_{uncorr}			
1.000	104	0.000	0.000	27426	0.000	0.000	0.000	6.69	6.55	0.000	-4	-50	54
						0.000	0.000	6.14	6.03	0.000	-6	-74	-10
						0.001	0.000	5.93	5.83	0.000	-6	-76	54
		0.049	0.007	739	0.000	0.717	0.042	4.33	4.29	0.000	-32	6	48
						0.990	0.098	3.96	3.93	0.000	-42	10	52
						1.000	0.998	2.29	2.29	0.011	-28	8	68
		0.366	0.039	485	0.001	1.000	0.163	3.73	3.70	0.000	40	20	48
						1.000	0.495	3.13	3.11	0.001	34	16	42
		1.000	0.896	83	0.124	1.000	0.174	3.69	3.67	0.000	-24	-54	52
		1.000	0.786	163	0.038	1.000	0.282	3.49	3.46	0.000	38	-60	-22
		1.000	0.896	106	0.085	1.000	0.670	2.93	2.92	0.002	28	14	28
						1.000	0.998	2.28	2.28	0.011	26	20	20
						1.000	0.998	2.17	2.16	0.015	22	8	28
		1.000	0.896	93	0.105	1.000	0.729	2.87	2.86	0.002	28	2	-2
		1.000	0.896	34	0.316	1.000	0.789	2.79	2.78	0.003	58	22	18
		1.000	0.896	32	0.331	1.000	0.829	2.75	2.74	0.003	74	-30	40
		1.000	0.896	45	0.249	1.000	0.916	2.65	2.64	0.004	40	64	-52
		1.000	0.896	3	0.796	1.000	0.937	2.62	2.61	0.004	18	-20	4
		1.000	0.896	48	0.235	1.000	0.998	2.53	2.52	0.006	32	-18	42
		0.974	0.237	280	0.009	1.000	0.998	2.52	2.51	0.006	-48	30	-8
						1.000	0.998	2.40	2.39	0.008	-36	34	-18
						1.000	0.998	2.16	2.16	0.016	-46	26	-16
		1.000	0.896	107	0.084	1.000	0.998	2.49	2.48	0.007	52	50	-32
						1.000	0.998	2.09	2.09	0.018	56	38	-34
						1.000	0.998	1.89	1.89	0.029	46	48	-24
		1.000	0.896	73	0.147	1.000	0.998	2.39	2.38	0.009	-6	30	54
		1.000	0.896	22	0.422	1.000	0.998	2.32	2.32	0.010	-54	30	4
		1.000	0.896	23	0.411	1.000	0.998	2.31	2.31	0.011	22	30	10
		1.000	0.896	4	0.758	1.000	0.998	2.24	2.23	0.013	24	12	16

table shows 3 local maxima more than 8.0mm apart

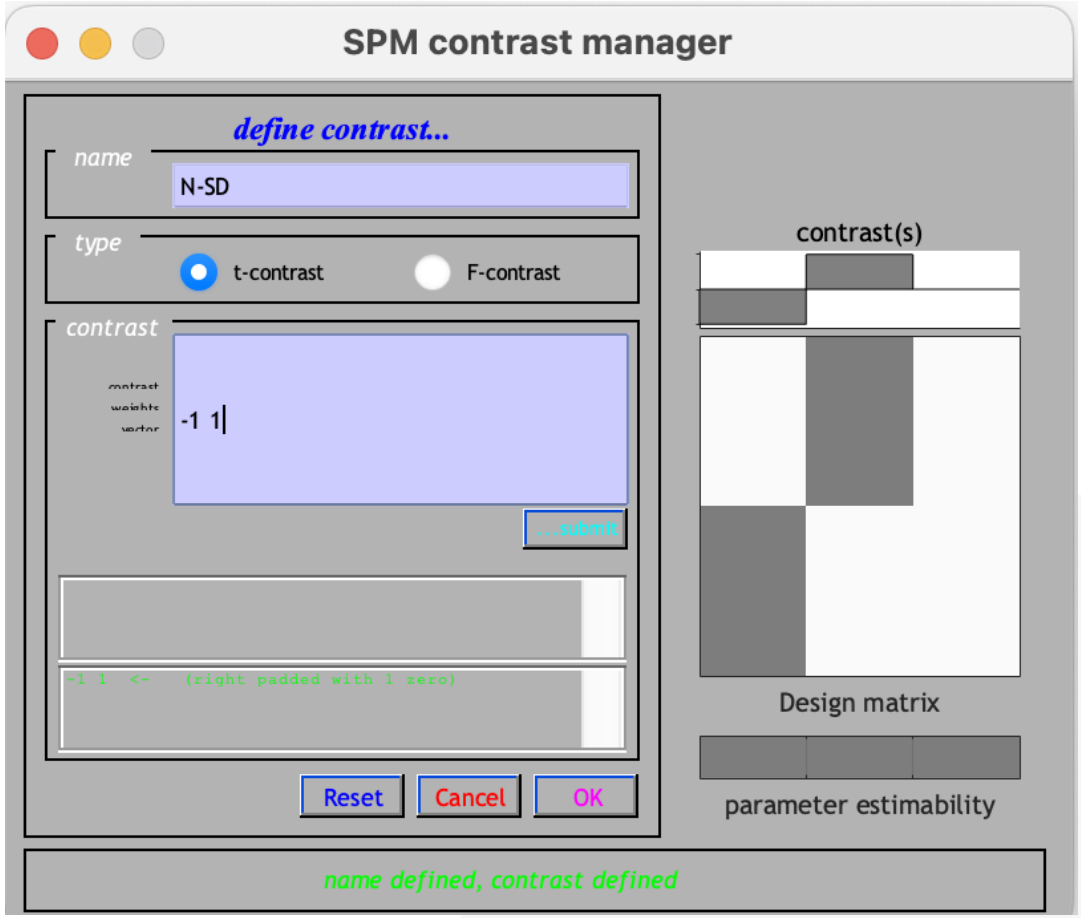
Sub001-sd-6-8

- Balloon 1/3
- Win1/3
- Lose1/3
- Win-lose1/3 -1/3 6个头动





Paired-t test

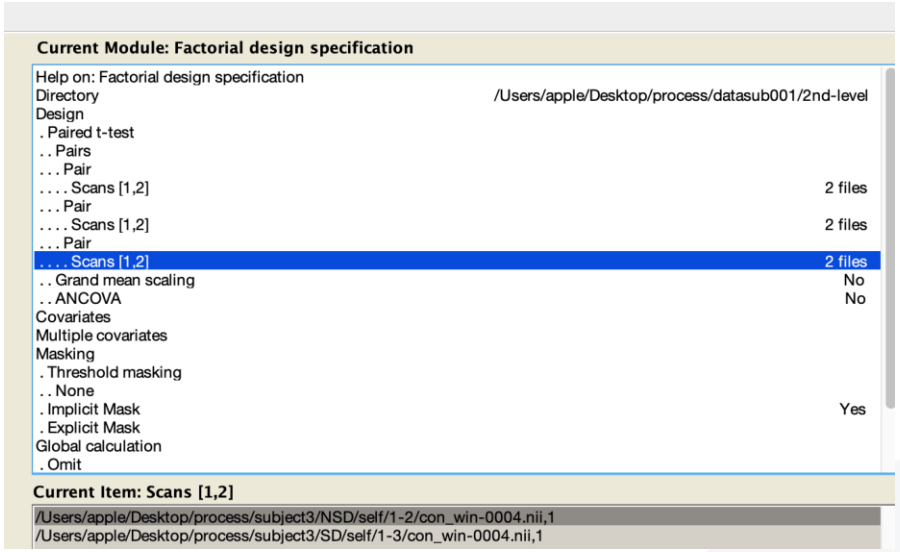


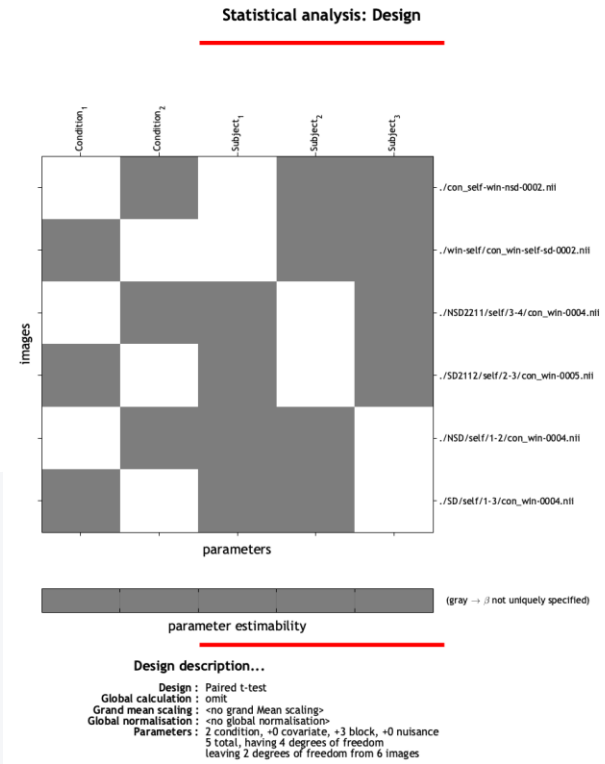
GLM

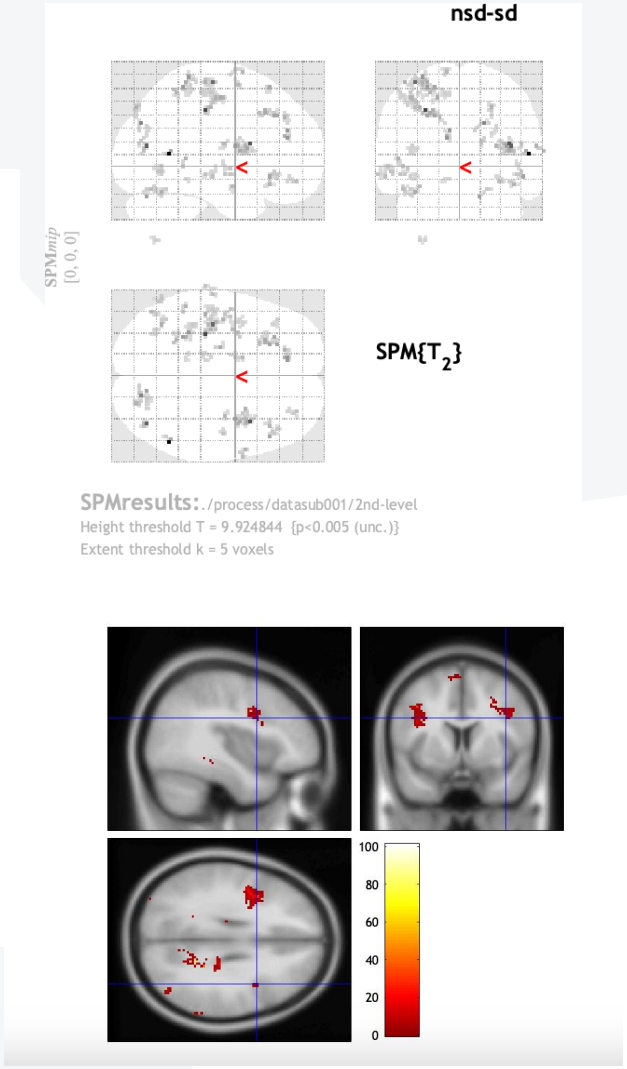
第二级分析:

- - 将SPM t-对比度图输入到第二级GLM中进行组分析。
- - 对每个条件进行了配对t检验。
- - **设置了整个脑部水平的阈值为未校正的p < .001，以及基于簇的家族错误（FWE）校正的p < .05。**

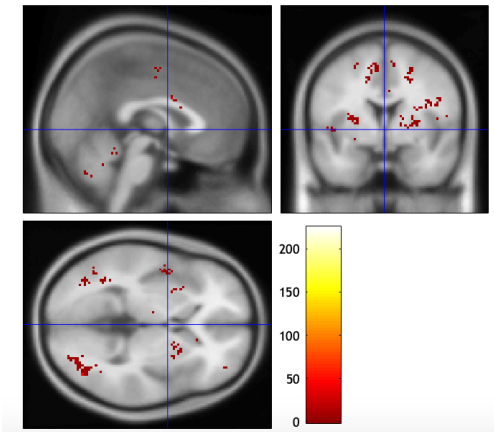
Paired t-test self-win(sd-nsd)

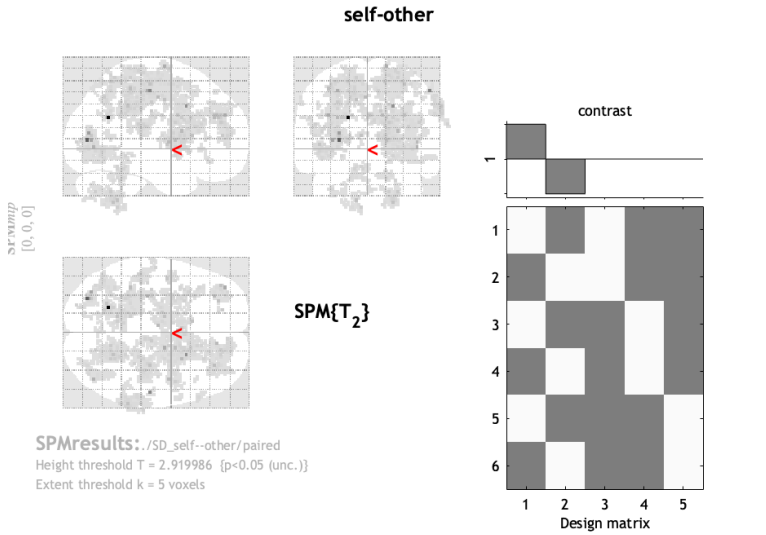






Paired t-test self-other(sd-lose)





Statistics: *p-values adjusted for search volume*

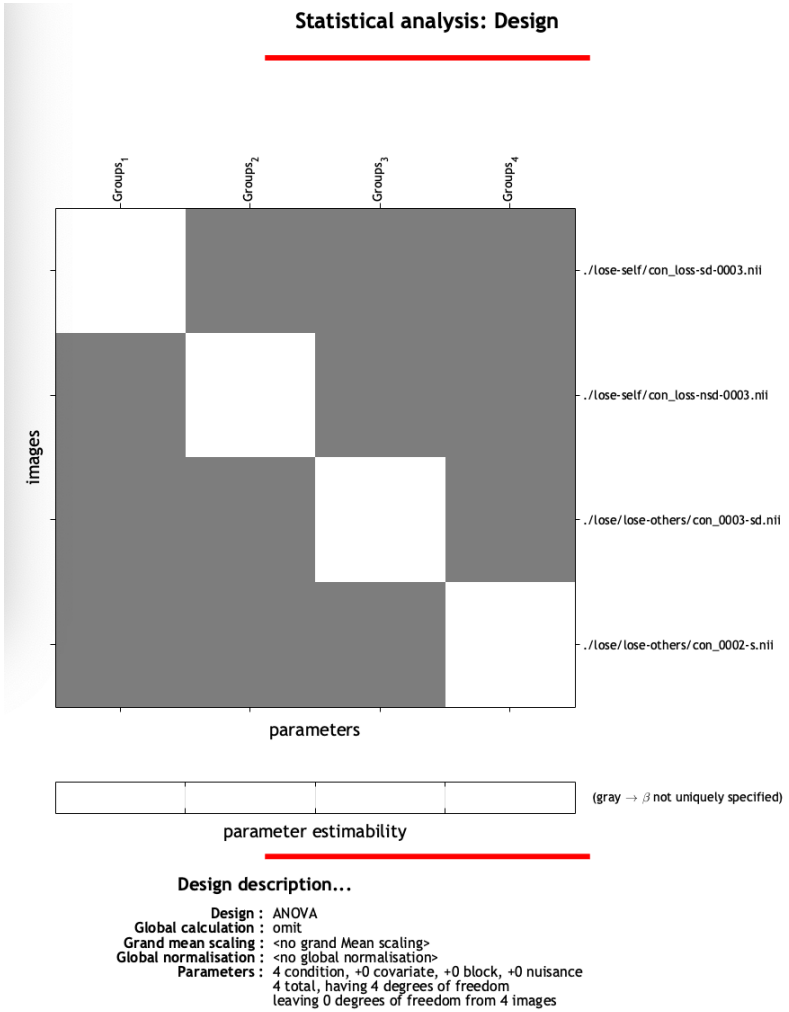
set-level		cluster-level				peak-level					mm mm mm	
p	c	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	k_E	p_{uncorr}	$p_{FWE\text{-}corr}$	$q_{FDR\text{-}corr}$	T	(Z_E)	p_{uncorr}		
NaN	73	NaN	1.000	1447	1.000	0.002	-0.405	225.07	4.27	0.000	-20 -60	26
						0.002	-0.932	52.89	3.57	0.000	16 -8	72
						0.002	-0.979	51.65	3.56	0.000	-30 -24	50
		NaN	1.000	121	1.000	0.002	-0.394	127.48	4.01	0.000	-28 -80	6
						0.000	-0.012	14.86	2.84	0.002	-22 -90	4
						1.000	0.306	8.60	2.48	0.007	-36 -74	4
		NaN	1.000	11	1.000	0.002	-0.485	89.00	3.83	0.000	56 -22	50
		NaN	1.000	12	1.000	0.002	-0.539	76.76	3.76	0.000	22 12	36
						1.000	0.656	4.93	2.07	0.019	16 18	36
		NaN	1.000	113	1.000	0.002	-0.881	57.16	3.61	0.000	-38 48	28
						0.002	-3.711	39.63	3.42	0.000	-30 38	26
						1.000	0.123	11.78	2.69	0.004	-36 44	20
		NaN	1.000	252	1.000	0.002	-1.092	47.16	3.51	0.000	44 -74	0
						1.000	0.043	13.63	2.79	0.003	32 -80	0
						1.000	0.512	6.24	2.25	0.012	42 -68	-12
		NaN	1.000	290	1.000	0.002	-1.707	41.51	3.44	0.000	12 40	28
						0.002	-11.162	37.30	3.38	0.000	32 38	28
						0.002	-0.684	25.46	3.17	0.001	18 44	22
		NaN	1.000	305	1.000	0.002	-2.778	40.70	3.43	0.000	26 8	14
						0.002	-7.440	37.53	3.39	0.000	16 2	6
						0.001	-0.078	16.18	2.89	0.002	16 10	10
		NaN	1.000	20	1.000	0.002	-5.579	37.75	3.39	0.000	44 -4	4
		NaN	1.000	107	1.000	0.002	-22.328	36.29	3.37	0.000	-38 -40	52
						0.001	-0.135	17.26	2.94	0.002	-30 -40	34
						1.000	0.229	9.80	2.57	0.005	-28 -42	48
		NaN	1.000	261	1.000	0.002	-2.469	33.01	3.32	0.000	66 -42	36
						0.002	-0.326	21.22	3.06	0.001	66 -48	30
						0.001	-0.188	18.48	2.98	0.001	66 -30	34
		NaN	1.000	41	1.000	0.002	-2.222	32.92	3.31	0.000	-12 -52	-48

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 2.92, p = 0.049 (1.000)
Extent threshold: k = 5 voxels, p = 1.000 (NaN)
Expected voxels per cluster, <k> = 1773191604.439
Expected number of clusters, <c> = -0.12
FWEp: -1230360.487, FDRp: 13.603, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 2.0]
FWHM = 3607.0 3707.9 3528.5 mm mm mm; 1803.5 1854.0 1764.2 {voxels}
Volume: 1551192 = 193899 voxels = 0.0 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 5898872186.96 voxels)

One-way anova



Future plan

- Paired *t* tests conducted for each condition.

- Associations between individual risk propensity (i.e., **average adjusted pump)** and **bilateral insula activation**

- **ROI：** **-**ROI analysis to visualize and confirm group differences in brain activity related to increased risk levels and outcome events, aiming to gain deeper insights into the neural mechanisms underlying decision-making processes.。

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Balloon Analoque Risk Task(BART)

Paired *t* tests conducted for each condition.

Associations between individual risk propensity (i.e., **average adjusted pump)** and **bilateral insula activation**

ROI： -ROI analysis to visualize and confirm group differences in brain activity related to increased risk levels and outcome events, aiming to gain deeper insights into the neural mechanisms underlying decision-making processes.

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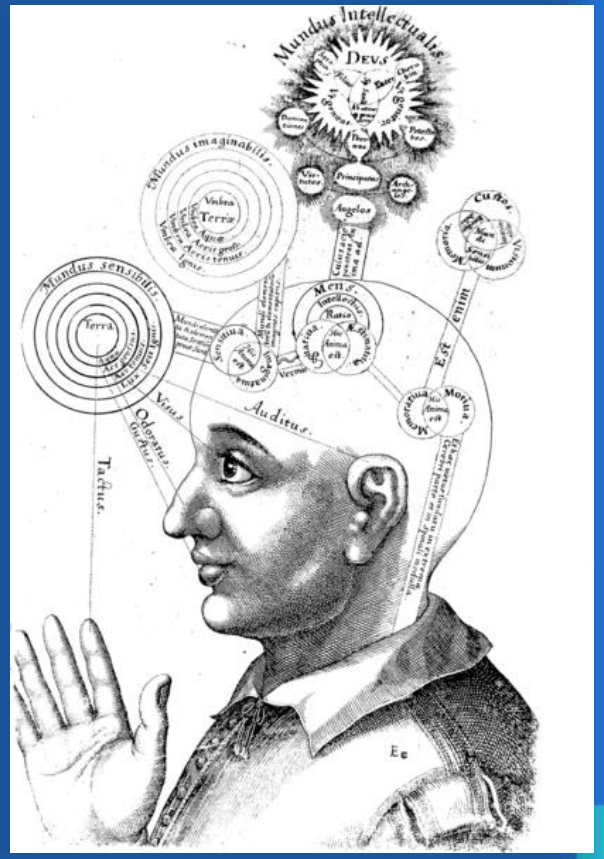
Balloon Analoque Risk Task(BART)

At the behavioral level, we observed a near-significant difference in reaction times (RTs), while no other significant differences were found.

However, in neuroimaging, significant brain activation differences were observed between deprived and non-deprived groups in response to win and lose events. Notably, no significant differences were observed between self and other conditions.

Thank You!


Mundus Intellectualis
DEVS
Mundus imaginabilis
Mundus sensibilis
Terra
Auditus.
Tactus.
Visus.
Olfactus.
Gustus.
Ec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