DIPLOMARBEIT

Titel der Diplomarbeit

„To Win Or Not To Lose

Neuronal Correlates of Altered Reward Processing Induced by rTMS of the left DLPFC in Smokers: a combined TMS/fMRI study“

verfasst von

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angestrebter akademischer Grad

Magister der Naturwissenschaften (Mag. rer. nat.)

Wien, 2014

Studienkennzahl lt. Studienblatt:	A 298
Studienrichtung lt. Studienblatt:	Diplomstudium Psychologie
Betreut von:	Mag. Dr. Jürgen Pripfl

Ich erkläre hiermit, dass ich diese Arbeit selbstständig und nur unter Verwendung der angeführen Hilfsmittel durchgeführt habe.

Martin Tik

Wien, 07.06.2014

Danksagung

An dieser Stelle möchte ich mich bei Prof. Dr. Claus Lamm für die Möglichkeit in seiner Forschungsgruppe zu arbeiten, bedanken.

Mag. Dr. Jürgen Pripfl danke ich für die Bereitstellung des Themas, Verbesserungsvorschläge und sein Engagement in der Betreuung meiner Diplomarbeit.

Außerdem bedanke ich mich bei Prof. Dr. Christian Windischberger, der mein Interesse für fMRT geweckt und die Grundlagen für mich in verständlicher Art und Weise erklärt hat.

Mein Dank gilt auch den vielen Kollegen aus den Lamm- und Windischberger- Arbeitsgruppen: Livia Tomova, Eva-Maria Seidel, Jasminka Majdandžic, Katharina Paul, Cornelia Siegl, Hanna Thaler, Arvina Grahl, Anna Wucherer, Jaqueline Atanelov, Lucia Navarro de Lara, Martin Küblböck, Michael Smesnik, Allan Hummer und André Hoffman (besonders für das Backup). Durch Anregungen und Diskussionen bei gemeinsamen Café-Pausen haben sie viel dazu beigetragen, dass diese Arbeit entstehen und ich mit Herausforderungen und Problemen umgehen konnte.

Speziell möchte ich mich an dieser Stelle bei Ronald Sladky bedanken. Durch seine Expertise in der Datenanalyse und sein breites wissenschaftliches Interesse, bot er mir immer wieder praktische Hilfe, Inspiration und viele Möglichkeiten etwas Neues zu entdecken - ob in Matlab, Günne oder auf hoher See (gegrillt, gebraten oder überbacken).

Anna-Lisa Schuler hat mich immer wieder vor der Verzweiflung bewahrt, wenn wieder mal etwas nicht funktioniert hat, für ihre Unterstützung, besonders beim Schreiben dieser Arbeit kann ich mich gar nicht genug bedanken.

Vielen Dank auch an Manuel Blaschek, der mir bei den Korrekturen behilflich war.

Zu guter Letzt bedanke ich mich bei meinen Eltern für die Unterstützung während des gesamten Studiums.

Abstract

Introduction. Motivation is what keeps us alive. Brain structures of mesocorticolimbic pathways help us to let us feel „rewarded" and thus keep us motivated. But still, not everything that makes us feel rewarded keeps us alive (see alcohol, cigarettes, sweets et cetera). rTMS over left DLPFC has shown therapeutic potential in addiction and other neuropsychiatric diseases.
In this study we investigated the effects of rTMS over left DLPFC on reward processing using the monetary incentive delay-task, MID-task (Knutson, 2001) in brains (fMRI) that feel especially rewarded by cigarettes. Blood oxygen level dependent (BOLD) contrasts were calculated for anticipating gains and losses and having gained or lost money.

Methods. 80 smokers (final analyses 67 subjects) matching the ICD-10 criteria for smoking dependency underwent rTMS sham (as a placebo) and verum stimulation (10min, 10Hz, 90% of MT) over left DLPFC. One run of the MID-task was performed before and one after stimulation.

Results. After verum rTMS over left DLPFC participants showed increased activity in prefrontal and somatosensory regions during gain anticipation. Contrarily, thalamic and striatal areas showed increased activity during loss anticipation. Reaction times where overall significantly lower for possible gain trials.

Conclusion. rTMS over left DLPFC seems to influence smokers' brain activity during anticipation of potential win and loss. Interestingly activity changes in basal structures could be revealed in loss but not win anticipation.

Zusammenfassung

Einleitung. Motivation hält uns am Leben. Gehirnstrukturen mesocorticolimbischer Bahnen sorgen dafür, dass wir uns „belohnt" fühlen und motivieren uns so zu lebenserhaltenden Aktivitäten. Jedoch nicht alles, was auf uns belohnend wirkt, hält uns auch am Leben (Alkohol, Zigaretten, Süßigkeiten etc.). rTMS des linken DLPFC scheint laut einigen Studien positive Effekte auf Sucht- und andere neuropsychiatrische Erkrankungen zu haben.
Diese Studie beschäftigt sich mit den Auswirkungen von rTMS über dem linken DLPFC auf (monetäre) Belohnungsverarbeitung. Vor und nach rTMS absolvierten Raucher_innen eine Art Gewinnspiel, den „Monetary Incentive Delay Task" (Knutson, 2001). fMRI BOLD Kontraste wurden berechnet für die Phasen, in denen möglicher Gewinn oder Verlust antizipiert wurde, sowie für Phasen, während derer den Versuchspersonen ein Rückmeldung über Gewinn oder Verlust gegeben wurde.

Methoden. 80 Raucher_innen (für endgültige Analysen 67 Versuchspersonen), die den ICD-10-Kriterien für Nikotinabhängigkeit entsprachen, wurden mittels rTMS (10min, 10Hz, 90% des MT) über dem linken DLPFC und über dem Vertex (Placebo) stimuliert. Vor und nach der Stimulation wurde jeweils ein MID-Task vorgegeben.

Ergebnisse. Nach der Stimulation mittels rTMS traten gesteigerte Aktivierungen im Präfrontalcortex sowie im somatosensorischen Cortex auf, während die Versuchspersonen einen möglichen Gewinn antizipierten. Im Gegensatz dazu wurden während der Antizipation von möglichen Verlusten (nicht aber bei Gewinnantizipation) striatäre und thalamische Areale stärker aktiv. Bezüglich der Verhaltensdaten waren die Reaktionszeiten generell niedriger für mögliche Gewinne.

Conclusio. Unseren Ergebnissen zu Folge hat es den Anschein als würde rTMS über dem linken DLPFC die Belohnungsverarbeitung von Raucher_innen auf neuronaler Ebene beeinflussen. Verstärkte Aktivierung in basalen Strukturen zeigte sich nach rTMS in Bezug auf Antizipation möglicher Verluste (nicht aber bei Gewinnantizipation).

Contents

Tables & Figures

1. Introduction

The adaptive recognition, anticipation and consumption of rewards are important motivational factors to sustain human life. On the other hand, aberrant reward processing might result in maladaptive behavior and turn this life sustaining effect into the opposite, as it occurs in addicted individuals.

When it comes to the most important motivational factors in (human) life, which are: feeding, fighting/fleeing and mating it is important to “want” to eat, to “want” to mate et cetera. Moreover people should be motivated to avoid potential dangers, such as getting attacked or losing money.

Through different (artificial or natural) substances which affect the reward system directly, these otherwise useful rewarding adaptions lead addicted persons to neglect life sustaining actions in favor of the consumption of one (or more) particular substance(s) as a substitute for naturally occurring rewarding situations.

In this thesis the anticipation of positive (gain) and negative (loss) rewards shall be highlighted by means of the monetary incentive delay task in combination with transcranial magnetic stimulation over left dorso-lateral prefrontal cortex.

1.1. Reward Processing

1.1.1. Phases of Reward Processing (Anticipation & Consumption)

There are two phases of reward processing that can be distinguished: the appetitive phase and the consummatory phase. This distinction goes back implicitly to Ivan Pavlov (1927) and his dogs, which started to salivate in expectancy of a reward. Schultz et al. (2000) were the first ones to show neuronal correlates of this separation in an animal study. In this study a heightened activation in the ventral striatum was found while monkeys were anticipating rewards. On the other hand the ventromedial prefrontal cortex (VMFC) and orbitofrontal cortex (OFC) showed heightened activity after the reward had been received.

Taking a closer look, especially the nucleus accumbens (NAcc) as a limbic structure and part of the ventral striatum is associated with heightened activity during reward anticipation (Schultz et al., 2000; Knutson et al., 2003, 2001a, b). The NAcc is a structure that shows a high dopamine receptor density. As a part of the dopaminergic system it plays a role in incentive sensitization (Feil et al. 2010a)

Spectating frontal regions of the brain, the DLPFC is heavily interconnected with cortical and subcortical areas as the medial prefrontal cortex (MPC), including the anterior cingulate cortex (ACC) and the orbitofrontal cortex (OFC). The latter structures (ACC and OFC) are cortical structures with a high density of dopaminergic neurons. The DLPFC (BA9/BA46) is also the part of the frontostriatal DLPFC circuitry, which is interconnected with the limbic system and thus the NAcc. Other parts are the nucleus caudatus, the globus pallidus, substantia nigra and the thalamus. This circuit is associated with goal identification and selection. Parallel to the DLPFC circuitry, there is the OFC-circuitry, associated with decision-making and regulation of impulsivity and the ACC-circuitry, associated with assessment of consequences and error detection (Feil et al., 2010a).

It can be summarized that the structures that are linked to reward processing are parts of the above mentioned circuits and communicate particularly via dopaminergic transmission.

1.2. Transcranial Magnetic Stimulation (TMS)

Transcranial magnetic stimulation is a comparatively new noninvasive neurostimulation method, which was first introduced to the scientific world by Barker and coworkers in 1985. In their experiments they stimulated the motor cortex in order to generate motor evoked potentials (MEP), i.e. a contraction of participant's hand muscle (Barker et al., 1985).

TMS allows conducting neuroscientific experiments that are in part comparable to invasive lesion or invasive stimulation studies in human brains, however, without causing permanent damage. Therefore it has become an attractive application in human cognitive neuroscience as it has a descriptive power that extends beyond pure correlation studies.

In general, there are two types of TMS application. During the repetitive variant of rTMS a train of electromagnetic pulses is induced in the brain, resulting in a depolarization of cortical neurons (Barker et al., 1985; Rachid and Bertschy, 2006, cited by Feil et al. 2010). This effect is based on the principle of electromagnetic induction first discovered by Nicola Tesla. The electric field is induced directly to cortical neurons without passing the scalp or skull, and enables ions to pass the passive ion-channels in cortical neurons resulting in amplitude changes of the membrane potential (according to Rossi et al. 2009). The stimulation is the most efficient at axon terminates, therefore in areas with short axons or where axons bend sharply. Additionally the thickness of the axons appears to have an influence on efficiency. The diameter of the axon is negatively associated with the stimulation threshold. (Experimental evidence by Amassian et al., 1992; Maccabee et al., 1993 and theoretical calculations by Nagarajan et al., 1993)

The intensity of the magnetic field produced by a TMS-stimulator, ranges commonly between 1.5 and 2 Tesla at the surface of the coil and induces electric fields of below 150 V/m in superficial cortical neurons (Rossi et al. 2009). This value is true for the application of the figure-of-eight coils, which consist of two conjoined wires, working by the means of alternating currents as well as for circular and double cone coils. All three forms of coils can produce an electric field of 1.5-3 cm depth beneath the scalp, depending on the stimulation intensity. The peak magnetic field of the figure-of-eight coil is situated at the interface between the two coils. This makes the stimulation by a figure-of-eight coil to the most focal rTMS method. However, the stimulation using a figure-of-eight coil is less deep than the double-cone stimulation (Rossi et al. 2009).

Low frequency rTMS, defined as stimulation at a frequency of 1Hz or less, is associated with corticospinal suppression. According to some authors (Huang et al., 2005; Houdayer et al., 2008, cited by Gerstner 2011) low frequency rTMS evokes neuronal effects similar to long term depression (LTD). On the other hand high frequency rTMS (stimulation at a frequency higher than 1Hz) results in corticospinal facilitation, leading to neuronal effects comparable to long term potentiation (LTP) (Huang et al., 2005; Houdayer et al., 2008, cited by Gerstner 2011).

1.2.1. Safety

According to the TMS safety guidelines side effects of TMS are very rare, under the condition that those guidelines are observed. For conventional rTMS over the motor cortex they propose stimulation output of up to 130%. At an intensity of 90% one train should last at most 5 seconds, which means 50 pulses per train. Those parameters are supposed to be transferable to conventional rTMS application outside the motor cortex. However, pregnant women and people with implants should not be stimulated, whereas people with neuropsychiatric diseases, disposition to epilepsy and/or who administer drugs or medicaments should be stimulated cautiously supervised by a physician (Rossi et al. 2009).

1.3. Functional Magnetic Resonance Imaging (fMRI)

Functional Magnetic Resonance Imaging (fMRI) is a non-invasive brain-mapping method, developed by Seiji Ogawa in the late 80s of the 20th century. It is characterized by a high spatial and good temporal resolution. The principle of fMRI is based on an indirect measure of the cerebral blood oxygen level (BOLD signal). If an area of the brain is more active oxygenated, arterial blood inflow is increased which leads to a lower level of deoxyhemoglobin in the activated area. Since oxygenated hemoglobin is diamagnetic and deoxygenated hemoglobin is paramagnetic, they show different reactions when exposed to an electromagnetic field. Thus, different neuronal activation levels can be recorded and distinguished. Since stronger activated areas consume more oxygen, they alter the MR signal. This signal is called hemodynamic response (HDR) and shows it's peak 5-6 s after neural activation.

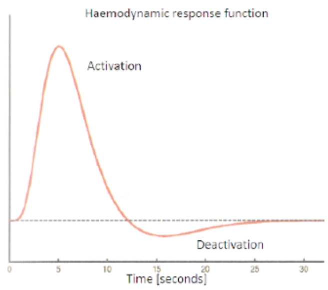

Figure 1:
Haemodynamic response function

Usual task-based fMRI experiments consist of several trials. During those trials participants are mostly exposed to visual or auditory stimuli. Neuronal activity is recorded for each single trial and then averaged over all trials of experimental conditions. The time span between the trials is called inter stimulus interval (ISI), which has to be chosen carefully to avoid overlapping of the hemodynamic response. fMRI experiments can be either blocked designs, where the exposure to a stimulus lasts for a relatively long time, or event-related designs where the exposure times are short.

1.3.1. Safety

FMRI is considered safe as long as performed within safety guidelines. Since the technique is based on alternating high magnetic fields people with magnetic metal or electronic implants in their bodies (pacemakers, surgical devices, metallic tattoos, aneurysm clips, surgical devices, etc.). Due to the narrowness of the fMRI scanner, care should be taken with claustrophobic individuals as well.

1.4. Neural Correlates of Reward Processing

Knutson et al. (2001a) investigated neuronal correlates of the anticipation of monetary reward and found an anticipatory activity in the NAcc proportional to the reward, whereas no such effect could be found in the anticipation of the punishment condition of this experiment. However, the expected activity change in the VMFC and OFC during feedback of reward outcome predicted by Schultz et al. (2000) could not be observed. In a follow up study Knutson et al. (2001b) investigated differences in event related fMRI data between the conditions „responding to an anticipated reward“ or „responding to no anticipated reward“. Based on their former findings and on the animal experiments by Schultz et al. (2000), they expected increased activity in the NAcc in the „responding to an anticipated reward“-condition, as well as an increased activation of the VMFC and OFC after a reward has been received when compared to the condition, where no reward was received.

As predicted, an increased activation of the NAcc was found during reward anticipation as well as an increased activation of the VMFC but not of the OFC during the feedback of a reward outcome. In a later study by Knutson et al. (2003) the activity changes in the NAcc going along with reward anticipation could be replicated. Additionally, parts of the MPF cortex showed a higher activation during reward outcome presentation. Knutson et al. (2003) attribute these findings to changes in dopamine release.

These three prementioned studies were all based on the performance of the monetary incentive delay (MID) task (Knutson et al., 2000). In another monetary reward anticipation study by Ernst et al. (2004) the wheel of fortune (WOF) task came to use. Their findings go along with Knutson et al. (2003, 2001a, b), i.e. increasing reward anticipation leads to increased activation in the ventral striatum.

In contradiction to the studies by Knutson et al. (2003, 2001a,b), Breiter et al. (2001) found an activation of the ventral striatum and the VMFC and OFC during reward anticipation at the same time. However significant changes in neuronal activity during the receipt of reward outcome could not be observed.

In a later study by Smith et al. (2009) using the WOF task, the former findings of Knutson et al. (2003, 2001a,b) and Ernst et al. (2004) that involve remarkable activation of the ventral striatum during the anticipatory phase of reward processing, could not be replicated.

As it is still unclear, which neuronal correlates appear during the process of the MID task, further research in this area is highly likely to provide valuable insights into the neuronal activation patterns and therefore the mechanisms behind reward processing.

	NAcc	Caudatus	Putamen	Pallidum	Thalamus	Amygdala	Insula	OFC	ACC	PCC	mPFC	SMA	
Knutson (2000)		x	x		-				-		x	x	
Knutson (2001a)	x	x	x		x	x			x	x	x	x	cereb, premotor
Knutson(2001b)	x	x	x		x	x					x	x	
Knutson (2003)	x	x			x		x				x	x	cereb
Breiter (2001)	x							x					VMFC
Ramnani, Miall (2003)			x	x		x	x			x	x	x	PFC, premotor, hippocampus,

Table 1: Overview of findings associated with monetary reward anticipation (Knutson & Greer, 2008)

	NAcc	Caudatus	Putamen	Pallidum	Thalamus	Amygdala	Insula	OFC	ACC	PCC	mPFC	SMA	
Knutson(2001b)		x	x		x			x		x			parietal cortex
Knutson (2003)										x	x		frontal pole, parietal cort
Breiter (2001)	x							x					VMFC
Oya et al. (2005)											x		vmPFC

Table 2: Overview of findings associated with monetary reward outcome presentation (Knutson & Greer, 2008)

1.5. rTMS Influence on Reward System

Many studies showed a therapeutic potential of rTMS in psychiatric disorders such as depression, obsessive-compulsive disorder (OCD), posttraumatic stress disorder (PTMSD) and schizophrenia (George et al., 1999 cited by Keck et al., 2002). The common stimulation protocol in depression treatment studies is an rTMS application between 10-20 Hz over the left DLPFC (Burt et al., 2002, cited by Griskova et al. 2007). Since patients with Parkinson's disease also show improvements in their symptoms after rTMS treatment, focus has been drawn on changes in dopaminergic activity in association with rTMS.

Based on these findings, many authors investigated the influence of rTMS on the dopamine release in animal studies. Among others, Keck et al. (2002) found, that 20Hz rTMS of rats' frontal brain area leads to an increased dopamine release in the dorsal hippocampus, NAcc shell and dorsal striatum. In accordance to that, Zangen and Hyodo (2002) observed an increase in extracellular dopamine as well as hightened glutamate levels in the NAcc upon stimulation above the frontal brain of rats in a similar microdialysis experiment. Finally, Kanno et al. (2004) administered 25 Hz rTMS over Wistar rats' frontal brain. The subsequent microdialysis revealed a continuously increased extracellular dopamine concentration in the dorsal striatum under the condition that the stimulation intensity was at about 110% of the motor threshold.

Going along with these findings, changes in dopamine release and consequential activation in the ACC, OFC and NAcc following 10 Hz transcranial magnetic stimulation over left DLPFC were found in humans by Cho and Strafella (2009).

Concerning the dopamine system, Taber et al. (1995) found that the PFC sends glutaminergic projections to dopaminergic neurons in the ventral tegmental area (VTA). The VTA is the origin of the mesocortical dopamine system, which sends - among others - dopaminergic projections to the ACC and NAcc upon receiving glutaminergic projections from the PFC. Moreover, van Zessen et al. (2012) suggest that exposition to reward-cues during the appetitive phase of reward processing leads to increased firing rates of GABAergic neurons in the NAcc. These increased firing rates in the NAcc lead to aberrant activity in dopaminergic neurons, which again would lead to maladaptive behavior during the appetitive phase of reward processing.

In addition, Vargas-Perez et al. (2010) even suggest that administration of opioid drugs increases the expression of brain derived neurotrophic factor in the VTA, inducing a functional shift in GABAergic neurons towards dopaminergic activity.

Considering the above mentioned outcomes we hypothesize that 10Hz rTMS application above the left DLPFC influences the dopamine system in cortical areas such as the ACC and OFC, in a way that is mediated by VTA activity and thus by the cognitive mechanisms of reward processing. Finally we would also expect bottom up triggered activation in the ventral striatum after rTMS of the left DLPFC, indicating an increased craving for monetary gain.

Linking this information, one might hypothesize that rTMS leads to an increased dopamine release in the NAcc and the areas it is connected with during the anticipatory phase of reward processing.

1.5.1. Therapeutic TMS Application

To complete this compilation of findings concerning neuronal correlates of reward processing and influences of prefrontal rTMS on the dopamine system other rTMS studies have already shown that 10Hz stimulation of the DLPFC transiently decreases craving in subjects that were addicted to cocaine (Camprodon et al., 2007), food (Barth et al., 2011; Uher et al., 2005) and nicotine (Amiaz et al., 2009).

Furthermore other studies suggest that prefrontal rTMS application is effective against depression symptoms (Loo and Mitchell, 2005). However not all of the subjects summarized in this review paper, which is based on 25 studies concerning rTMS efficacy on depressive patients did respond to the treatment.

2. Hypotheses

2.1. Hypotheses MID

Derived from the theoretical background given above, we have the following hypotheses concerning the neuronal feedback to the MID-task:

H1, $_{1MID}$: There is an increased activity in structures as the NAcc (see Table 1) during the presentation of a reward anticipatory stimulus.

H1, $_{2MID}$: There is an increased activity in the VMFC and OFC (see Table 2) during the presentation of a reward outcome.

2.2. Hypotheses TMS

H1, $_{1TMS}$: Verum rTMS of the left DLPFC leads to activity changes in structures, such as the NAcc (see Table 1) during reward anticipation (e.g. Keck et al., 2002)

H1, $_{2TMS}$: Verum rTMS of the left DLPFC leads to activity changes in frontal brain regions such as the cingulate cortex and OFC (see Table 2) during reward anticipation/ reward outcome presentation (e.g. Cho & Strafella, 2009)

3. Methods

3.1. Participants

Participants were 80 right-handed smokers without any neurological or psychiatric disease. For the fMRI analyses 67 subjects were included (36 men, 31 women, age: 25.01y). Nine subjects had to be excluded because of technical problems and four subjects were excluded because of too strong artifacts (strong movements). In order to exclude subjects that do not fulfill the inclusion criteria in advance, the screening of the Structured Clinical Interview (SCID) was performed at the beginning of the first experimental session. In addition, to screen neurological patients, a TMS-Checklist (see appendix) was administered to participants. Handedness was assessed with the Edinburgh Handedness Inventory (EHI; Oldfield, 1971). To preclude mood effects, the Positive and Negative Affect Schedule (PANAS; Watson and Tellegen, 1988) was administered to each participant before and after each session.

3.2. Design

3.2.1. Monetary Incentive Delay Task (MID-Task)

The MID task was designed by Knutson et al. (2000) to induce the anticipatory and consummatory phase of (monetary) reward processing. In this study the MID task was repeated three times. That is once before and twice after TMS application. Each MID task consists of 54 about 6s lasting trials (18 of each category). During each trial, participants were exposed to a circled plus, a circled minus or only a circle. The plus indicated the possibility to win, the minus the possibility to lose and the circle marks the neutral condition. The symbol was followed by a fixation symbol (question mark), which was shown for an interval chittered with 2-2.5s. Afterwards, participants had to respond to a target square, which appeared until button-press or one second if no button was pressed. Finally, the outcome was presented to the subject for 1.5s. There are three possible outcomes: win, loss or neither.

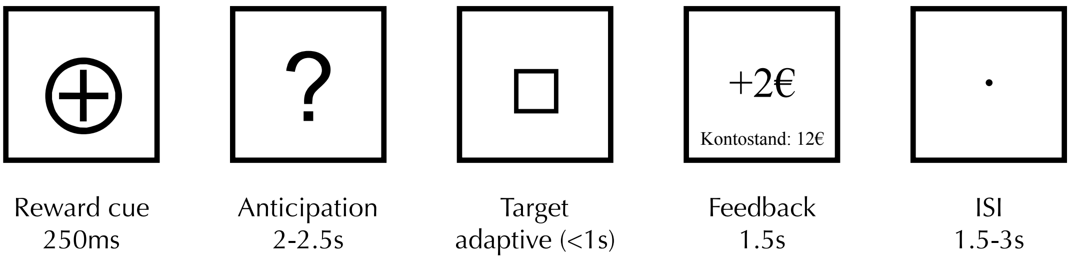

Figure 2 illustrates the time course of the MID-task.

3.2.2. TMS Protocol

The TMS-coil used for this study was a figure-of-eight-shaped MR-compatible coil (MRi-B90 II; Magventure MagPro X 100 stimulator Tonica Elektronik A/S, Denmark). Prior to each stimulation session, the motor threshold was defined for each participant. In order to define the motor threshold, three EEG-electrodes were placed in a belly-tendon application on the right hand. After locating the M1 target area via neuronavigation (Brainsight 2, Rogue Research Inc., Canada), single TMS-pulses were applied at an intensity of 80% stimulator output. The coil was positioned in a 45° angle in relation to the surface of the skull. The so-called hand-knob is regarded in the axial plane an omega or epsilon-shaped (e.g. Yousry et al., 1997) structure in the lateral precentral gyrus. The representational field of the first dorsal interosseus (FDI) muscle served as target area and is placed at the outer edge of the hand-knob. It is defined individually for each subject by visual judgment. The stimulation intensity was decreased until the lowest intensity was found, at which 3 of 5 pulses applied in a row result in a MEP response between 0.5-1.0 mV within a time frame between 15ms and 35ms after application.

For the real condition, the TMS coil was placed above the left DLPFC, for sham above the vertex. Stimulation was at a frequency of 10 Hz with a stimulation time of 5s per train and a rate of 24 trains. The inter train interval (ITI) was 20s. Therefore the total stimulation time was 10 min, while the total number of pulses was 1200. The stimulator output was 90% of the motor threshold.

3.2.3. Brainsight

Brainsight is a neuronavigation software for Mac OS X, which helps to support frameless stereotactical TMS application. To operate frameless stereotaxy following devices come to use: i) the Polaris optical position sensor (Northern Digital, Waterloo, ON, Canada), that contains two infrared cameras, ii) trackers, which are reflectors, whose configuration patterns are visible to the Polaris, those trackers can be attached to a special pair of glasses (subject tracker), the TMS-coil (coil tracker). They are also attached to iii) the pointer tool. The pointer tool and the subject tracker are essential to locate the subjects head (brain) in the room. Once the subject's loci have been registrated, it is possible to track the person's skull and brain by means of a T1 magnetic resonance imaging (MRI) structure scan displayed by the Brainsight software. This allows to position the TMS coil above a target region in the cortex to improve stimulation focality.

3.2.4. fMRI Data Acquisition

The imaging was performed using a whole-body 3 Tesla Tim Trio (Siemens Medical, Germany) whole-body MR-Tomograph combined with the manufacturer's default 32-channel head coil (Siemens Medical, Germany). 15 3-mm-thick slices were acquired through the saggital axis centered above the fissura longitudinalis. For T1 weighted anatomical image acquisition, the parameters were optimized for optimal imaging results in limbic regions including amygdala, ventral striatum and orbitofrontal cortex. The functional T2-scans were performed by means of a phase-corrected blipped GE, single-shot EPI sequence sequence (TE/TR=40/1800ms, 128*128 matrix, 210*250 FOV, in-plane resolution 1.65 by 1.95 mm, 15 axial slices parallel to the AC-PC-plane, thickness 3 mm), whereas the structural T1-scans were acquired using a MP-RAGE sequence (128 slices, 256*256 matrix, 200*200*200 FOV, slice thickness 1.56 mm, axial in- plane resolution of 0.78*0.78 mm).

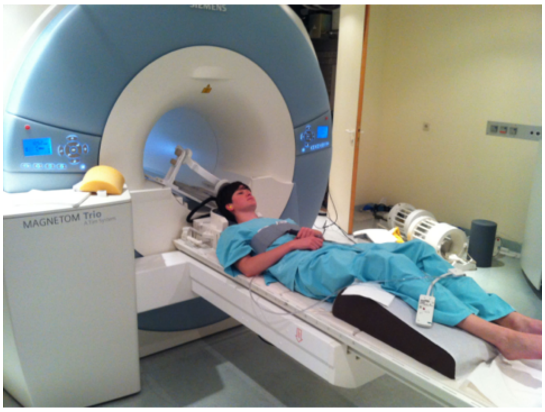

Figure 3: TMS stimulation setup inside scanner room

3.2.5. Questionnaires

Prior to and after each session the PANAS was submitted to the subjects in order to preclude moderating mood effects. Additionally all subjects were asked: "Do you currently want to quit smoking" and had to rate if they want it: (1) a lot, (2) somewhat, (3) a little bit and (4) not at all. This question had been established in many studies (e.g. Criddenten et al., 1994; Hymowitz et al., 1997; Sciamanna et al., 2000: Borland et al.. 2010).

4. Data analyses

4.1. Behavioral Data

To analyze the behavioral response data (i.e. reaction times) of the MID a 2x2x2 repeated measures ANOVA was performed using the PASW 18.0 software, with stimulation condition (real, sham), run (pre, post1) and valence (positive, negative) as within-subject factors.

In order to find out, if there were baseline differences, a 2x3 repeated measures ANOVA was calculated featuring the factors stimulation condition (real, sham) and valence (positive, negative, neutral).

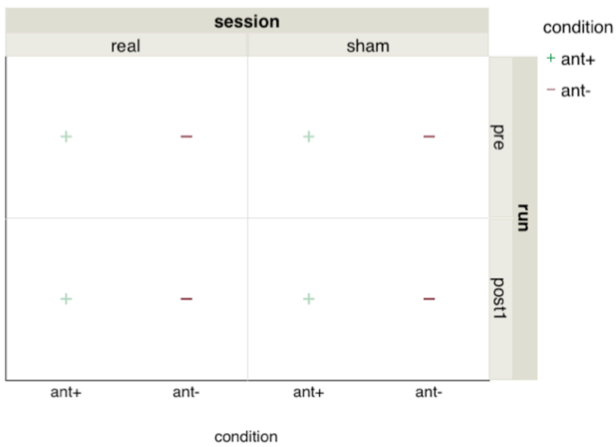

Figure 4: Design illustration of behavioral data analyses session, run, valence (2x2x2)

4.2. Physiological Data (fMRI)

In order to investigate activity changes due to stimulation/valence blood-oxygen-level dependent signal (BOLD) contrasts during the anticipatory phase and outcome phase were the centre of focus. Data analysis was performed using statistical parametric mapping software SPM12b (http://www.fil.ion.ucl.ac.uk/spm/), implemented in Matlab (The Mathworks Inc., Sherborn, MA, USA) and home-written Matlab-Scripts.

The prepossessing was done in the following steps:

1. Realignment to account for motion between the slides
2. Coregistration to overlap the structural with the functional data
3. Normalisation to warp the images into a standard brain template
4. Smoothing by a 8mm kernel to raise the signal-to noise ratio
5. Slice-timing correction to shift data of different offset recorded slices in time, in order to make them seem as if they were recorded at once (Sladky et al., 2011)

4.2.1. First Level Analyses

During the first level analysis the following contrasts were computed to remove visual and motor activation:

- All potential gain sequences (ant+)
  vs. neutral anticipation sequences
- All potential loss sequences (ant-)
  vs. neutral anticipation sequences
- All potential gain hit (i.e. win) outcome sequences (out+win)
  vs. neutral outcome sequences
- All potential gain miss (i.e. no win) outcome sequences (out+nowin)
  vs. neutral outcome sequences
- All potential loss hit (i.e. no-loss) outcome sequences (out-nolo)
  vs. neutral outcome sequences
- All potential loss miss (i.e. loss) outcome sequences (out-lo)
  vs. neutral outcome sequences

4.2.2. Second Level Analyses

The preprocessed and contrasted data was then used to perform separate second level analyses for each of the firstlevel contrasts across subjects.

Each of the firstlevel contrasts (see 5.2.1) was included in a separate flexible factorial design.

The separate design matrices for each of the sequences of interest include 4 fields (sham_pre; sham_post; real_pre; real_post).

sham_pre	sham_post	real_pre	real_post
(first level contrasts of placebo session before sham stimulation)	(first level contrasts of placebo session after sham stimulation)	(first level contrasts of real session before verum rTMS stimulation)	(first level contrasts of real session after verum rTMS stimulation)

Table 3: fMRI Second level design

Finally, to test MID and TMS hypotheses (see 2.1 & 2.2) the following calculations were done:

1. **Task activation**: Merging sham_pre & real_pre in a T-contrast revealed task activation across subjects independent of TMS or time effects.
2. **TMS Effects**: T-contrasts between real_post and real_pre revealed changes in activation caused by real stimulation.
   T-contrasts between sham_post and sham_pre allowed us to account for possible placebo or general time effects.

The corresponding sham contrasts (post vs. pre contrasts) will not be presented in 6.2, since no voxels survived at the chosen significance level ($p<0.001$, uncorr.). The output of the full analyses is included in the appendix.

5. Results

5.1. Behavioral Data

The repeated-measures ANOVA revealed no baseline differences for the factor stimulation condition. However, reaction times differed significantly for the factor valence ($F(1.244, 78.343)=38.21$, $p<.001$, partial eta squared=.378). Degrees of freedom were Greenhouse-Geisser (epsilon=.622) corrected, since Mauchly's test indicated a violation of the sphericity assumption (chisquare=58.133, $p<.001$).

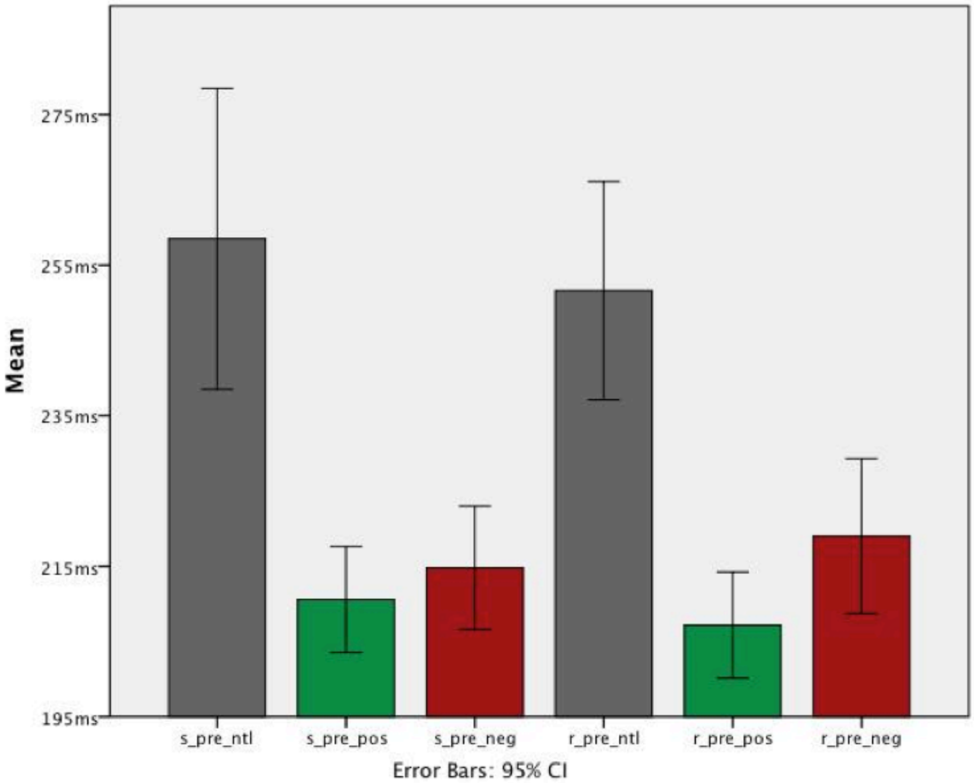

Figure 5: Baseline comparisons revealed differences between neutral trials and potential win as well as loss trials ($p<.001$, meandiff_pos=47.987ms, meandiff_neg=41.187ms).

A Bonferroni adjusted post-hoc pair-wise comparison specified that participants were significantly slower in the neutral trials compared to the other conditions ($p<.001$, meandifference_pos=47.987ms, meandifference_neg=41.187ms).

Furthermore, participants showed a trend in responding faster in positive trials compared to negative trials (p=.064, meandifference=-6.799ms). The huge difference in reaction times between neutral and the two other conditions questions the neutral condition as being an adequate control within our design (in line with previous findings, see discussion).

Possible explanations, why participants were significantly slower are that participants were able to penetrate the task mechanisms or learned them implicitly. Therefore we neglected the neutral trials for further behavioral data analysis.

The 2x2x2 repeated-measures ANOVA revealed a main effect of the factor valence (F(1, 63)=12.674 , p=.001, partial eta squared=.167). A Bonferroni adjusted post-hoc pair-wise comparison specified that participants were significantly faster in positive trials compared to negative trials (p=.001, meandifference=-7.192ms).

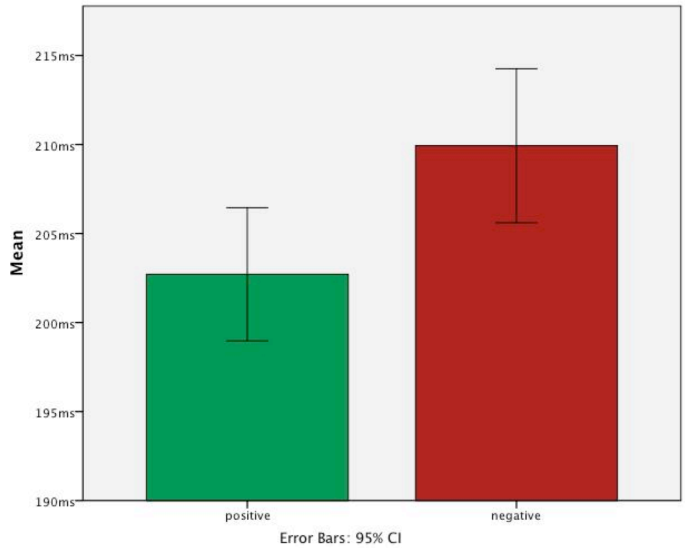

Figure 6: Main effect of valence:
Participants reacted faster in potential win trials.

5.2. fMRI: MID Task Activation

5.2.1. Anticipation of potential gain (ant+)

As already indicated by many other studies (compare Knutson & Greer 2008) during the positive anticipatory phase (ant+>ant0) bilateral striatal areas such as the pallidum, putamen, NAcc, thalamus as well as the cerebellum, bilateral insula cortex, rostral posterior CC, SMA and amygdala showed heightened activity. Additionally, the occipital lobe showed a stronger activation.

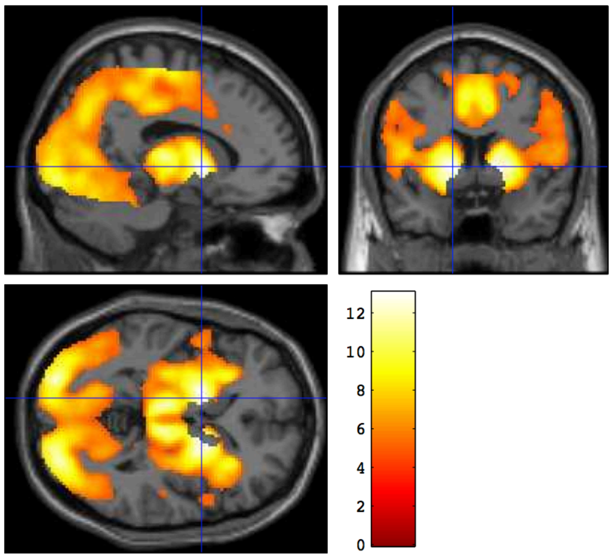

Figure 7: Anticipation of potential gain (ant+>ant0) @ p<0.05 (FWE corr., k=20 voxels)

Cluster	k (voxel)	T-Value	Peak (MNI)
left ventral striatum	69498	13,03	[-14;6;0]
right ventral striatum		13,03	[14;6;2]
right occipital cortex		12,58	[26;-90;-4]
right middle frontal gyrus	221	5,69	[44;50;22]
		5,25	[44;54;10]
	48	5,07	[32;36;24]
		4,85	[34;36;32]
	30	5,02	[40;44;34]
left middle frontal gyrus	27	4,89	[-36;50;12]

Table 4: Activation foci for potential gain anticipation (ant+>ant0), p<0.05, k=20 voxel

5.2.2. Anticipation of a possible loss

During the negative anticipation (ant->ant0) a quite similar activation pattern could be observed (compare Figure 7 & Figure 8).

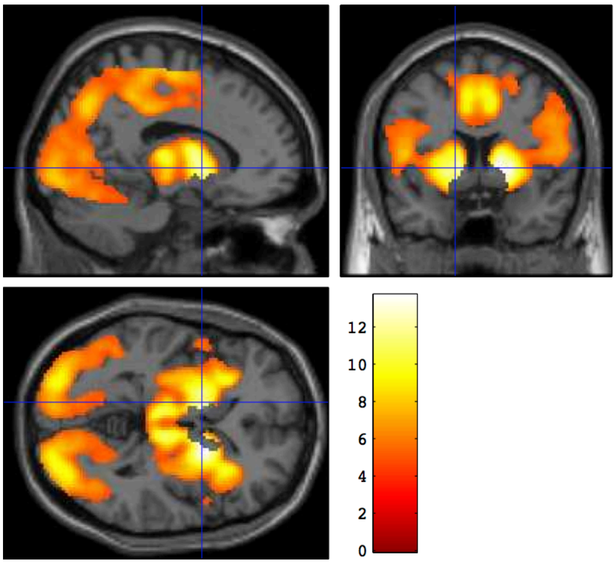

Figure 8: Anticipation of potential loss (ant->ant0) @ p<0.05 (FWE corr., k=20 voxels)

Cluster	k (voxel)	T-Value	Peak (MNI)
right ventral striatum	53162	13,66	[20;8;0]
left ventral striatum		12,34	[-12;6;2]
right brainstem		11,58	[8;-24;-6]
right middle frontal gyrus	804	7,12	[32;36;28]
		6,02	[36;48;22]
		5,50	[32;46;10]
left middle frontal gyrus	345	6,00	[-34;36;28]
		5,65	[-36;34;38]
right posterior cingulate cortex	95	5,66	[6;-24;28]
left posterior cingulate cortex		5,47	[-6;-26;30]
		4,89	[-6;-36;24]
left postcentral gyrus	85	5,47	[-56;-20;20]

Table 5: Activation foci for potential loss anticipation (ant->ant0), p<0.05, k=20 voxel

5.3. fMRI: TMS Effects on MID Task Activation

Considering the argumentation by Lieberman and Cunningham (2009), we decided to report rTMS related effects thresholded at a more liberal significance level of p<0.001, uncorr. (see Discussion).

5.3.1. Potential gain anticipation (post>pre verum stimulation)

The contrast between positive anticipation trials before and after real stimulation revealed a bilateral activation in the (rostral) posterior cingulate cortex and somatosensory cortex (Figure 9 left). Additionally there was a significant activation change in the bilateral premotor cortex (Figure 9 right).

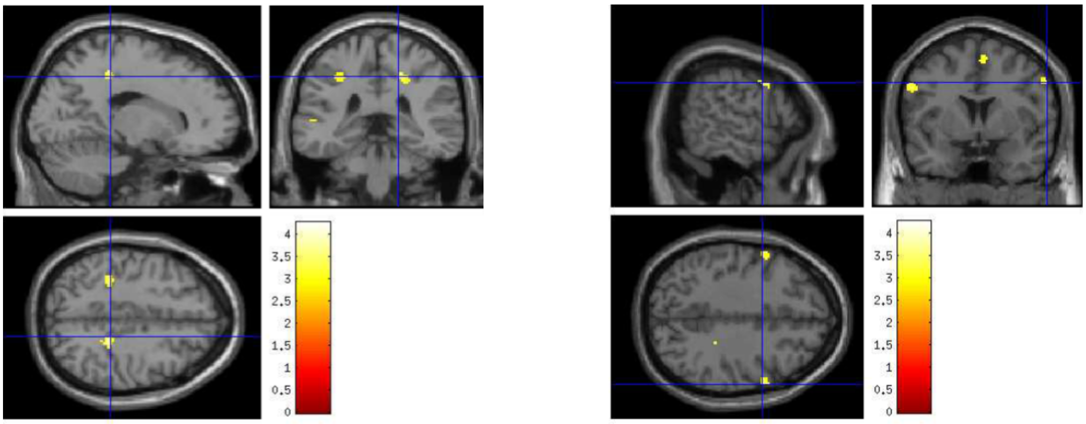

Figure 9: Verum TMS effects on gain anticipation (ant+>ant0) @ p<0.001, uncorr.; k=5

Cluster	k (voxel)	T-Value	Peak (MNI)
Right somatosensory cortex, superior parietal lobe	37	4,26	[20;-36;46]
Left premotor cortex	59	3,62	[-58;6;34]
Left somatosensory cortex, superior parietal lobe	17	3,50	[-30;-36;44]
Right premotor cortex	9	3,42	[60;4;40]

Table 6: Activation foci for verum TMS effects on potential gain anticipation (ant+>ant0), p<0.001, uncorr.; k=5 voxels

5.3.2. Potential loss anticipation (post>pre verum stimulation)

The contrast between negative anticipation trials before and after real stimulation revealed an increased activation in the right ventral pallidum, right ventral putamen, right caudate nucleus and right thalamus, pons.

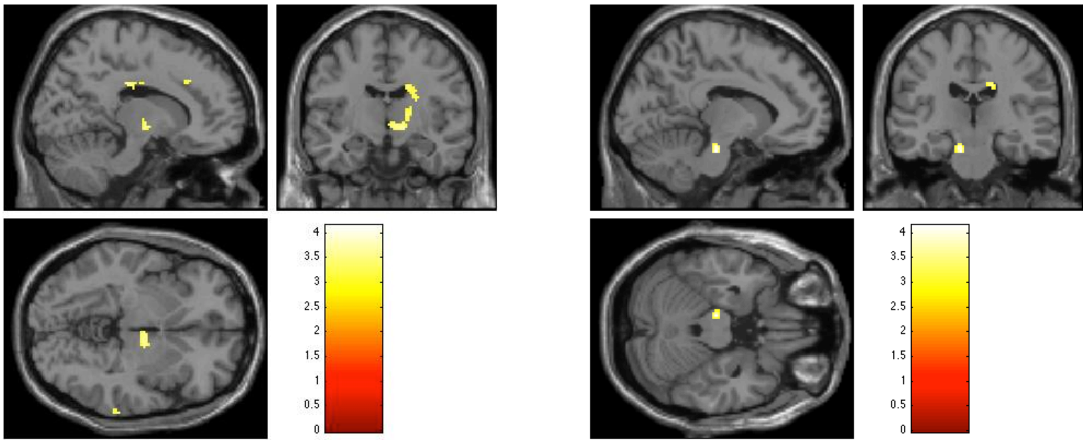

Figure 10: Verum TMS effects on loss anticipation (ant->ant0) @ p<0.001, uncorr.; k=5

Cluster	k (voxel)	T-Value	Peak (MNI)
left brainstem, pons (7 voxel)	27	4,14	[-10;-22;-24]
right thalamus (23 voxel), right brainstem (21 voxel)	54	3,70	[14;-10;-4]
		3,51	[18;-10;6]
right middle temporal gyrus	9	3,60	[70;-34;-6]
right posterior cingulate cortex	46	3,60	[14;-24;32]
right nucleus caudatus		3,58	[20;-12;28]
		3,36	[24;-10;20]
left inferior frontal gyrus (6 voxel), left insula (5 voxel)	10	3,41	[-24;10;-18]
left postcentral gyrus	10	3,39	[-36;-36;46]
right middle frontal gyrus	10	3,36	[44;24;26]
right fusiform gyrus	6	3,35	[34;-54;-14]
right anterior cingulate cortex	6	3,34	[12;26;34]

Table 7: Activation foci for verum TMS effects on potential loss anticipation (ant->ant0), p<0.001, uncorr.; k=5 voxels

5.3.3. No-Win Outcome (post>pre verum stimulation)

After stimulation the presentation of a failed win (out+nowin) revealed an increased activation compared to pre in the right superior frontal gyrus, medial (Figure 11).

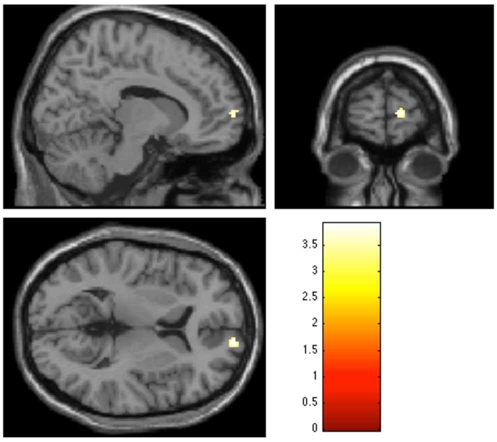

Figure 11: Verum TMS effects on feedback of a no-win outcome (out+) @ p<0.001, uncorr.;

Cluster	k (voxel)	T-Value	Peak (MNI)
right superior frontal gyrus, medial	30	3,92	[12;66;6]

Table 8: Activation foci for verum TMS effects on feedback of a no-win outcome (out+), p<0.001, uncorr.; k=5 voxels

6. Discussion

6.1. Replication of other Studies

Our fMRI BOLD contrasts for gain anticipation>neutral and loss anticipation>neutral revealed a typical set of significantly higher activated areas implicated in reward processing (see Knutson & Greer, 2008) as hypothesised in $H1_{,1MID}$. Reaction times were significantly higher for neutral trials compared to possible gain/loss trials going along with literature (Pfabigan et al., 2014, in press; Votinov et al.,2014). Due to the adaptive nature of our task design, slower reaction times in a neutral trial subsequently led to easier win trials. This strategy increases the possible overall win (see limitations).

Anticipation of potential positive and negative outcomes (i.e. win/lose) showed very similar activation patterns.

Contrary to our hypothesis, outcome contrasts revealed no interpretable frontal task-related activity ($H1_{,2MID}$).

6.2. Effects of rTMS over left DLPFC

We could not find any rTMS task related activity changes that survived family-wise error correction. Lieberman and Cunningham (2009) argue that statistical thresholding has become increasingly conservative: Common FWE correction at a p-value of 0.05 decreases the number of false positive findings tremendously. The disadvantage of that conservative practice is that false negatives could include weaker but important complex cognitive and affective effects and would be overlooked. They propose, based on simulations, that cluster size thresholds, such as $P < 0.005$ with a 10 voxel extent, produce a desirable balance between Types I and II error rates.

Considering the argumentation of Lieberman and Cunningham (2009) and our study being one of the first using combined rTMS/fMRI, we decided to report findings more liberally at a significance level of 0.001, uncorr.

Compared to baseline, during anticipation of a potential win after rTMS over lDLPFC whole brain analysis revealed the following activation pattern: increased activity close to stimulation site (i.e. in the left superior frontal lobe and premotor area), bilateral somatosensory and neighboring right posterior cingulate cortex (see Figure 9). Contrary to negative anticipation (see below), we could not observe activation changes in basal regions but in cortical regions (see Cho & Strafella, 2009). Although highly speculative, one could argue that the evaluation of possible gain stimuli is altered due to verum stimulation. However, we could not find any changes on a behavioral level.

During anticipation of a negative outcome after rTMS over lDLPFC, we observed an increased activity in the nucleus coeruleus, parts of the bilateral nucleus caudatus, right pallidum and putamen (see Figure 10).

To our knowledge the effects of rTMS on reward processing by means of fMRI BOLD contrasts have not been investigated before. However, Weber et al. (2014) found activity changes in the right nucleus caudatus after tDCS over bilateral DLPFC in combination with losses but not wins. Furthermore, Clewett, Schoeke and Mather (2014, in press) found that the nucleus coeruleus and its functional connectivity with the left anterior insula and DLPFC play a crucial role in encoding and monitoring negative and surprising outcomes.

Concerning task activation, we could replicate former findings for anticipation (see above). In terms of rTMS effects, we found task specific activity changes in frontal regions during positive anticipation (see above) and in basal regions during negative anticipation (see above). Since this study is of exploratory nature, more research is needed to find out more about the influence of rTMS over lDLPFC on reward processing of addicted individuals and its behavioral implications.

6.3. Limitations

The adaptive nature of our version of the MID task possibly introduces a bias: Participants reacted significantly slower during neutral trials. Possible explanations for that are that participants were able to penetrate the task mechanisms or learned them implicitly. This questions the neutral trials as an adequate control.

Concerning TMS stimulation, we were equipped with precise technical solutions for neuronavigation and took great efforts to stimulate the individually calculated DLPFC ROIs monitoring participants during stimulation, yet for several reasons ideal stimulation could not be guaranteed: Since it was not possible to perform the TMS stimulation simultanously to fMRI acquisition, we could not be sure to stimulate the same area, respectively. Additionally, unavoidable movement of the participants could lead to a variation in stimulation loci. The development of special fMRI coils for online rTMS studies can help to overcome such shortcomings, since they allow to directly study the effects of local TMS-induced alterations of cortical excitability (de Lara et al., 2013).

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8. Appendices

8.1. MR Checklist

ProbandInnen-Name

Um ein bei Ihnen möglicherweise bestehendes höheres Risiko besser abschätzen zu können, bitten wir Sie, **folgende Fragen durch Ankreuzen zu beantworten:**

1. **Haben oder hatten Sie einen Herzschrittmacher?**	ja	nein	weiß nicht
2. **Wurde bei Ihnen eine Operation am Herzen, am Kopf oder an einem Gelenk durchgeführt?**	ja	nein	weiß nicht
Wenn ja: Haben Sie Implantate? z.B. Defibrillator, Herzklappe, Ohrimplantat, Aneurysmaclip, Insulinpumpe, Schmerzpumpe, Gelenksprothese, Shunt, Port-a-Cath, Stent	ja	nein	weiß nicht
Welche:………………………………………………..			
3. **Haben Sie Metallteile o. –splitter (Marknagel,…) im Körper?**	ja	nein	weiß nicht
Wenn ja, welche:………………………………………			
4. **Haben Sie schon einmal eine MR-Untersuchung gehabt?**	ja	nein	
Wenn ja: hat es dabei Probleme gegeben?	ja	nein	
Welche:…………………………………………………			
5. **Leiden Sie unter Platzangst?**	ja	nein	
6. **Leiden Sie an einer Nierenerkrankung oder sind Sie schon an der Niere operiert worden?**	ja	nein	weiß nicht
7. **Leiden Sie an Zuckerkrankheit (Diabetes)?**	ja	nein	
8. **Leiden Sie an Bluthochdruck (Hypertonie)?**	ja	nein	
9. **Leiden Sie an Gicht?**	ja	nein	
10. **Haben Sie Allergien, Asthma oder Medikamenten-unverträglichkeiten?**	ja	nein	weiß nicht
Wenn ja, welche:………………………………………..			
Allergische Reaktionen auf MR-Kontrastmittel sind extrem selten. Jodallergien spielen bei dieser Untersuchung keine Rolle.			
11. **Sind Sie tätowiert, tragen Sie Körperschmuck (Piercing)?**	ja	nein	

12. **Körpergewicht ……………….. kg** **Körpergröße ……………… cm**

Für Probandinnen:

14. **Könnten Sie schwanger sein?**	ja	nein	weiß nicht
15. **Verhüten Sie mit Spirale?**	ja	nein	

8.2. TMS Checklist

Social, Cognitive and Affective Neuroscience Unit
TMS TeilnehmerInnen-Checkliste
Version September 26, 2011

Name: ____________________________ Geburtsdatum: _____________________

Datum der Untersuchung: ____________________________

Transkranielle Magnetstimulation (TMS) ist eine sichere und nützliche Methode zur Untersuchung der Funktionsweise des menschlichen Gehirns. TMS kann ohne Risiko für Ihre Gesundheit und Sicherheit eingesetzt werden, sofern Sie bestimmte Kriterien erfüllen.
Bitte beantworten Sie wahrheitsgetreu die folgenden Fragen (durch Ankreuzen der entsprechenden Antwort):

(1). Hatten Sie jemals eine negative Reaktion auf eine TMS-Untersuchung?

[Ja] [Nein]

(2). Hatten Sie jemals einen epileptischen Anfall?

[Ja] [Nein]

(3). Hatten Sie jemals einen Gehirnschlag?

[Ja] [Nein]

(4). Hatten Sie jemals eine Kopf- oder Gehirnoperation?

[Ja] [Nein]

(5). Haben Sie Metallteile in Ihrem Körper (ausgenommen Zahnimplantate oder Plomben), wie etwa Schrapnell, chirurgische Implantate/Clips, oder (auch kleine) Metallteile vom Schweißen oder der Metallbearbeitung?

[Ja] [Nein]

(6). Haben Sie irgendwelche implantierten Geräte, wie etwa Herzschrittmacher, medizinische Pumpen, oder Herzkathether bzw. -drähte?

[Ja] [Nein]

(7). Leiden Sie an schweren Kopfschmerzen, oder haben Sie häufig Kopfschmerzen?

[Ja] [Nein]

(8). Hatten Sie jemals andere, mit dem Zentralnervensystem (Gehirn) in Zusammenhang stehende Probleme oder Störungen?

[Ja] [Nein]

(9). Hatten Sie jemals eine Krankheit, die zu einer Gehirnschädigung führte?

[Ja] [Nein]

(10). Nehmen Sie psychiatrisch verordnete oder sonstige psycho- oder neuroaktive Medikamente (z.B. Antidepressiva, Neuroleptika, Lithium)?

[Ja] [Nein]

(11). Falls Sie eine Frau sind: Sind Sie schwanger?

[Ja] [Nein]

Datum der letzten Periode: ______________________

Falls länger als 30 Tage: Kann es sein dass Sie schwanger sind?

[Ja] [Nein]

(12). Hatte jemand in Ihrer Familie jemals einen epileptischen Anfall?

[Ja] [Nein]

(13). Sind Sie beruflich regelmäßig mit dem Lenken von Kraftfahrzeugen (Auto, LKW, Bus, Tram, Zug) oder dem Bedienen von sonstigen selbstfahrenden Fahrzeugen beschäftigt?

[Ja] [Nein]

(14). Hatten Sie letzte Nacht unzureichend Schlaf?

[Ja] [Nein]

(15). Haben Sie letzte Nacht große Mengen an Alkohol, Nikotin, oder sonstigen psychotropen Substanzen konsumiert?

[Ja] [Nein]

(16). Sind Sie drogenabhängig, alkoholabhängig, oder medikamentenabhängig?

[Ja] [Nein]

(17). Haben Sie metallische Gegenstände in ihrer Kleidung oder am Körper – inkl. Piercings, Ohrringe? Falls ja: bitte legen Sie diese ab.

[Ja] [Nein]

Anmerkungen Testleiter/-in:

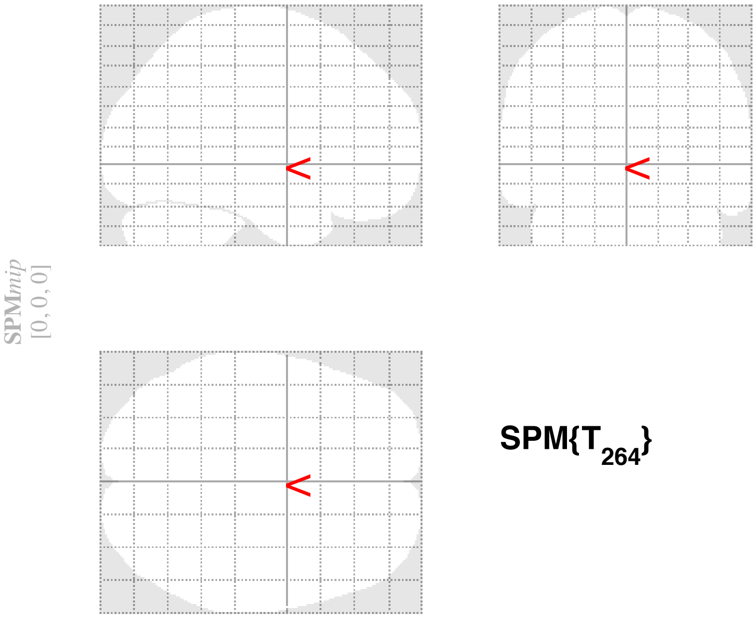
Ich wurde darüber aufgeklärt, dass ich für mindestens 3 Stunden nach der Untersuchung kein Kraftfahrzeug lenken darf.

Unterschrift Versuchsperson: ________________________________, am__________

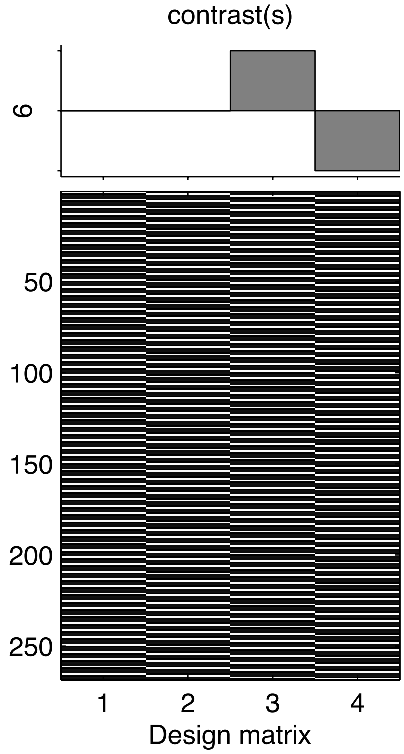
Unterschrift TestleiterIn: ___________________________________, am __________

8.3. SPM maps

real_post1<pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_ant−>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

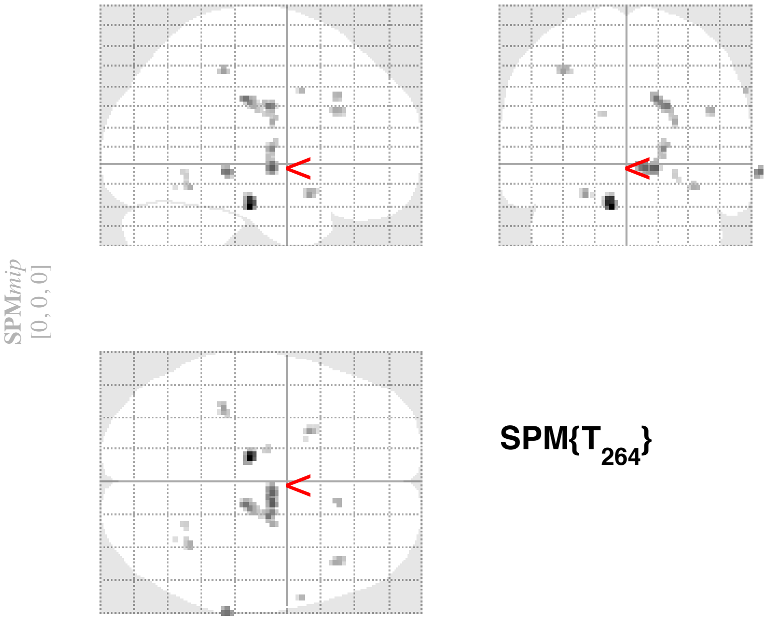
no suprathreshold clusters

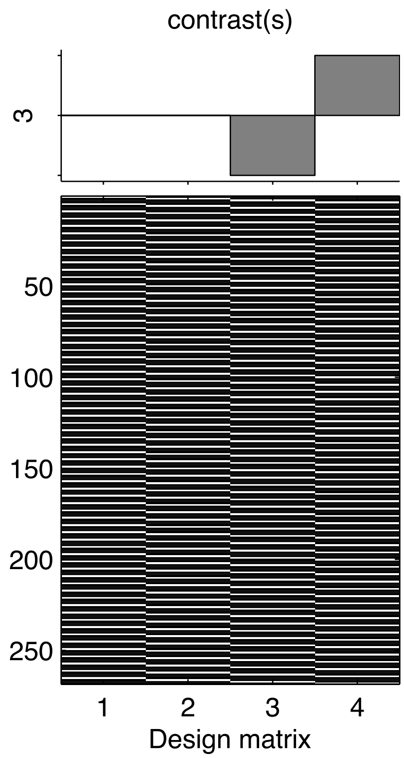
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.522
Expected number of clusters, <c> = 6.25
FWEp: 4.645, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.4 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 553.4 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 264.67 voxels)

real_post1>pre





SPMresults: ./sl2014/2ses2run_ant−>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p−values adjusted for search volume*

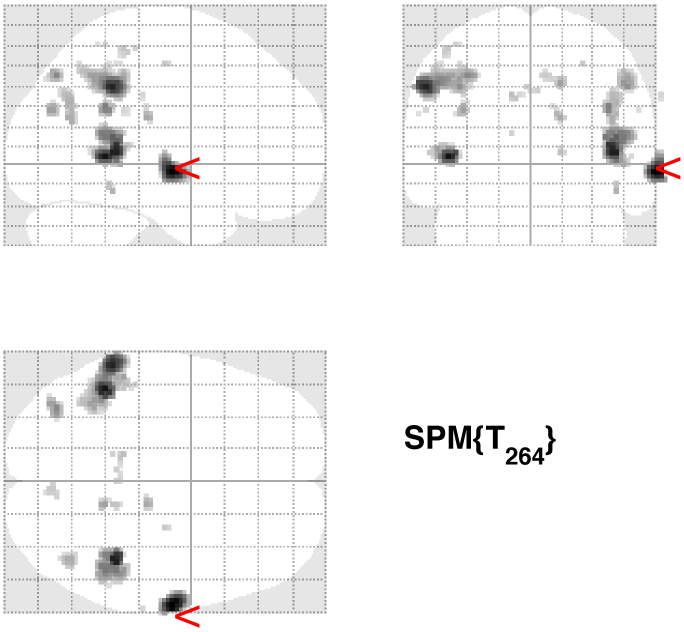
set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_\equiv)$	p_{uncorr}	
0.005	14	0.871	0.884	27	0.328	0.273	0.821	4.14	4.07	0.000	−10 −22 −24
		0.656	0.884	54	0.171	0.729	0.821	3.70	3.65	0.000	14 −10 −4
						0.898	0.821	3.51	3.47	0.000	18 −10 6
		0.974	0.884	9	0.585	0.826	0.821	3.60	3.56	0.000	70 −34 −6
		0.721	0.884	46	0.204	0.833	0.821	3.60	3.55	0.000	14 −24 32
						0.846	0.821	3.58	3.53	0.000	20 −12 28
						0.969	0.821	3.36	3.32	0.000	24 −10 20
		0.970	0.884	10	0.563	0.949	0.821	3.41	3.37	0.000	−24 10 −18
		0.970	0.884	10	0.563	0.958	0.821	3.39	3.35	0.000	−36 −36 46
		0.970	0.884	10	0.563	0.968	0.821	3.36	3.32	0.000	44 24 26
		0.984	0.884	6	0.664	0.971	0.821	3.35	3.31	0.000	34 −54 −14
		0.984	0.884	6	0.664	0.974	0.821	3.34	3.30	0.000	12 26 34
		0.994	0.884	2	0.822	0.980	0.823	3.31	3.27	0.001	62 6 36
		0.992	0.884	3	0.773	0.993	0.902	3.21	3.18	0.001	−14 −12 24
		0.990	0.884	4	0.732	0.994	0.902	3.21	3.17	0.001	24 −56 −8
		0.996	0.884	1	0.884	0.998	0.996	3.13	3.10	0.001	−20 8 −18
		0.996	0.884	1	0.884	0.998	0.996	3.12	3.09	0.001	32 −62 −14

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.522
Expected number of clusters, <c> = 6.25
FWEp: 4.645, FDRp: Inf, FWEc: Inf, FDRc: Inf

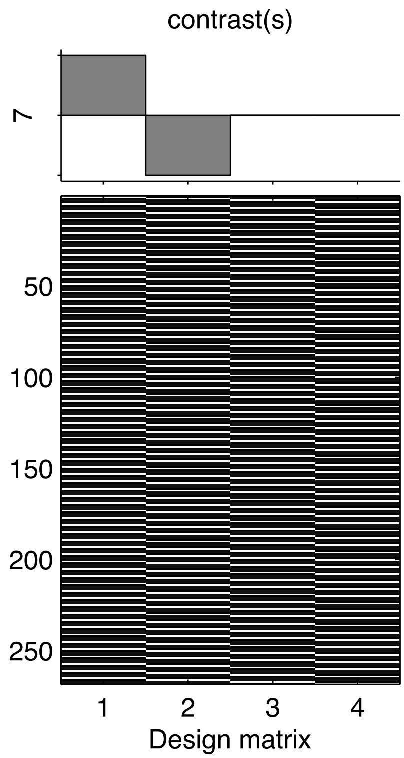
Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.4 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 553.4 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 264.67 voxels)

sham_post1<pre



SPMmip [68, −8, 0]

SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_ant−>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p−values adjusted for search volume*

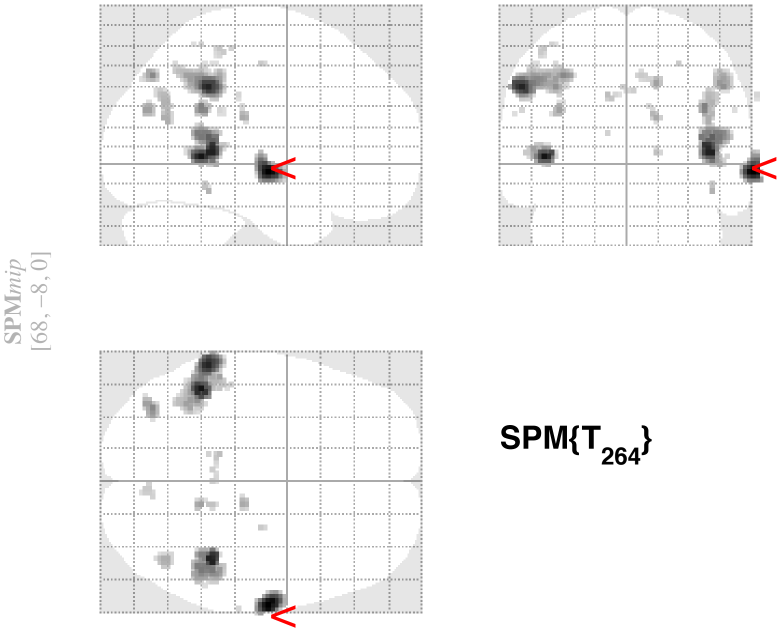
set−level		cluster−level				peak−level					
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	mm mm mm
0.000	**29**	**0.196**	**0.275**	**141**	**0.035**	**0.053**	**0.303**	**4.63**	**4.54**	**0.000**	**66 −12 −6**
		0.211	**0.275**	**136**	**0.038**	**0.095**	**0.303**	**4.47**	**4.39**	**0.000**	**−46 −48 2**
						0.893	0.811	3.52	3.48	0.000	−52 −38 6
		0.045	**0.108**	**249**	**0.007**	**0.126**	**0.303**	**4.39**	**4.31**	**0.000**	**42 −44 4**
						0.459	0.772	3.95	3.89	0.000	44 −44 12
						0.915	0.812	3.48	3.44	0.000	48 −40 −2
		0.011	**0.049**	**370**	**0.002**	**0.140**	**0.303**	**4.36**	**4.28**	**0.000**	**−58 −44 38**
						0.791	0.811	3.64	3.59	0.000	−40 −50 38
						0.875	0.811	3.54	3.50	0.000	−44 −54 44
		0.893	**0.884**	**24**	**0.357**	**0.684**	**0.772**	**3.74**	**3.69**	**0.000**	**40 −48 28**
		0.857	**0.884**	**29**	**0.311**	**0.737**	**0.811**	**3.70**	**3.65**	**0.000**	**−36 −74 44**
		0.648	**0.881**	**55**	**0.167**	**0.802**	**0.811**	**3.63**	**3.58**	**0.000**	**50 −40 38**
		0.931	**0.884**	**18**	**0.427**	**0.882**	**0.811**	**3.53**	**3.49**	**0.000**	**−38 −76 26**
		0.970	**0.884**	**10**	**0.563**	**0.890**	**0.811**	**3.52**	**3.48**	**0.000**	**14 −48 40**
		0.957	**0.884**	**13**	**0.504**	**0.920**	**0.812**	**3.47**	**3.43**	**0.000**	**14 −26 22**
		0.680	**0.881**	**51**	**0.182**	**0.937**	**0.822**	**3.44**	**3.40**	**0.000**	**42 −66 20**
						0.944	0.822	3.43	3.39	0.000	44 −68 30
		0.990	**0.884**	**4**	**0.732**	**0.944**	**0.822**	**3.43**	**3.39**	**0.000**	**44 −44 −16**
		0.987	**0.884**	**5**	**0.696**	**0.974**	**0.958**	**3.34**	**3.30**	**0.000**	**−12 −38 34**
		0.987	**0.884**	**5**	**0.696**	**0.976**	**0.958**	**3.33**	**3.29**	**0.000**	**14 −42 4**
		0.974	**0.884**	**9**	**0.585**	**0.983**	**0.961**	**3.29**	**3.26**	**0.001**	**−46 −38 58**
		0.952	**0.884**	**14**	**0.487**	**0.986**	**0.961**	**3.28**	**3.24**	**0.001**	**6 −76 44**

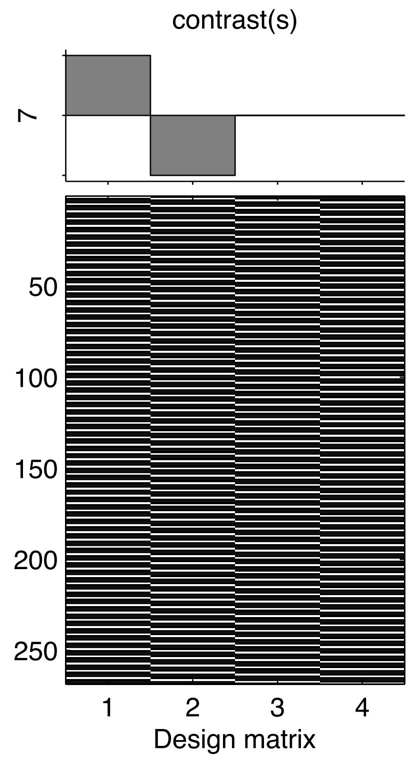
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.522
Expected number of clusters, <c> = 6.25
FWEp: 4.645, FDRp: Inf, FWEc: 249, FDRc: 370

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.4 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 553.4 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 264.67 voxels)

sham_post1<pre





SPMresults: ./sl2014/2ses2run_ant−>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p−values adjusted for search volume*

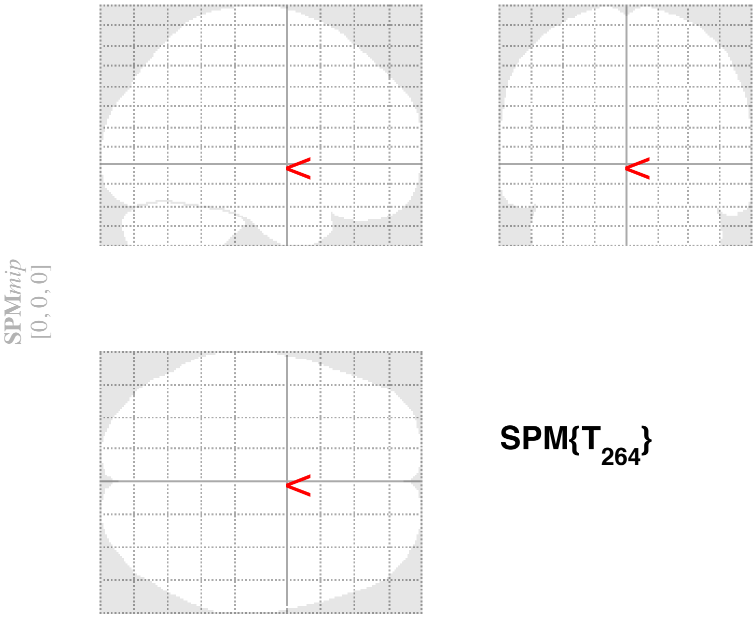
set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.994	0.884	2	0.822	0.988	0.961	3.26	3.23	0.001	26 −16 50
		0.990	0.884	4	0.732	0.992	0.961	3.23	3.19	0.001	2 −42 36
		0.996	0.884	1	0.884	0.992	0.961	3.23	3.19	0.001	−4 −42 38
		0.996	0.884	1	0.884	0.993	0.961	3.21	3.18	0.001	−42 −48 60
		0.996	0.884	1	0.884	0.994	0.961	3.20	3.17	0.001	−48 −32 58
		0.996	0.884	1	0.884	0.994	0.961	3.20	3.17	0.001	−12 −44 14
		0.994	0.884	2	0.822	0.995	0.961	3.19	3.15	0.001	−58 −38 26
		0.994	0.884	2	0.822	0.996	0.961	3.18	3.14	0.001	68 −28 34
		0.996	0.884	1	0.884	0.996	0.961	3.17	3.14	0.001	52 −38 2
		0.994	0.884	2	0.822	0.997	0.982	3.14	3.11	0.001	−50 −42 50
		0.996	0.884	1	0.884	0.997	0.982	3.14	3.11	0.001	56 −46 26
		0.996	0.884	1	0.884	0.998	0.982	3.13	3.10	0.001	−40 −52 60
		0.994	0.884	2	0.822	0.998	0.982	3.13	3.10	0.001	−62 −38 24

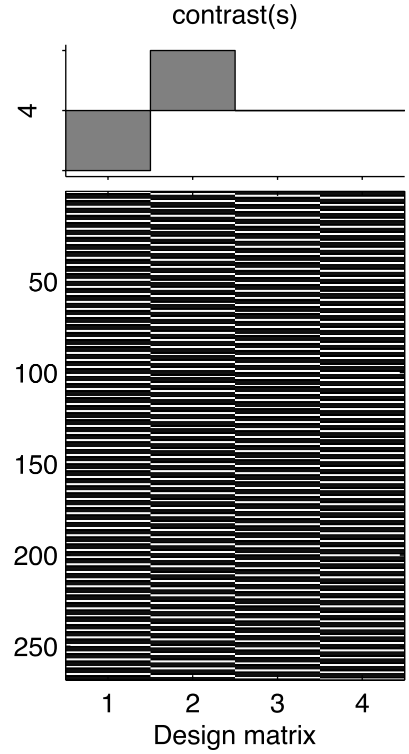
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.522
Expected number of clusters, <c> = 6.25
FWEp: 4.645, FDRp: Inf, FWEc: 249, FDRc: 370

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.4 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 553.4 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 264.67 voxels)

sham_post1>pre



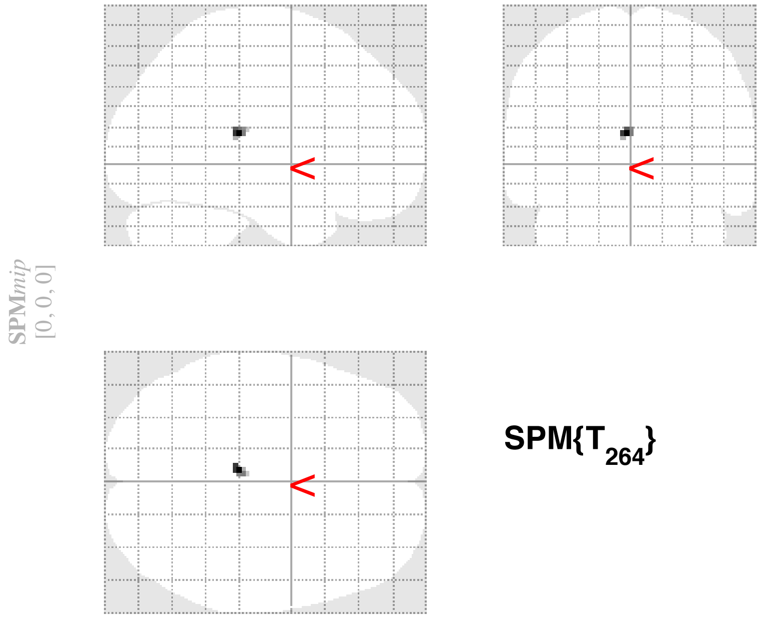


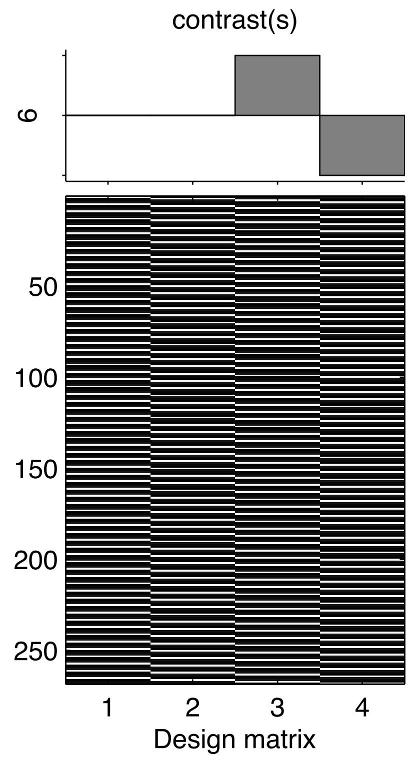
SPMresults: ./sl2014/2ses2run_ant->ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

real_post1<pre





SPM{T_{264}}

SPMresults: ./sl2014/2ses2run_ant+>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

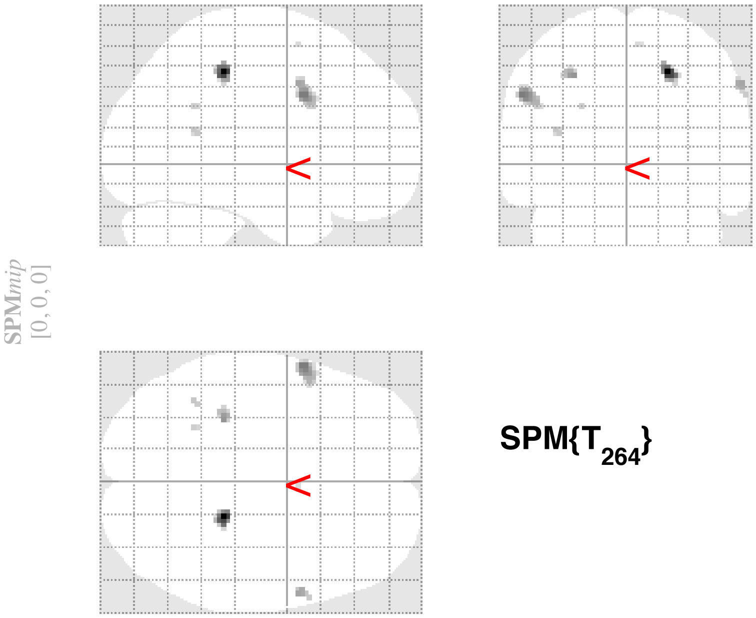
set–level		cluster–level				peak–level					mm mm mm
p	c					$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.942	0.550	13	0.550	0.890	0.425	3.46	3.41	0.000	-4 -30 14

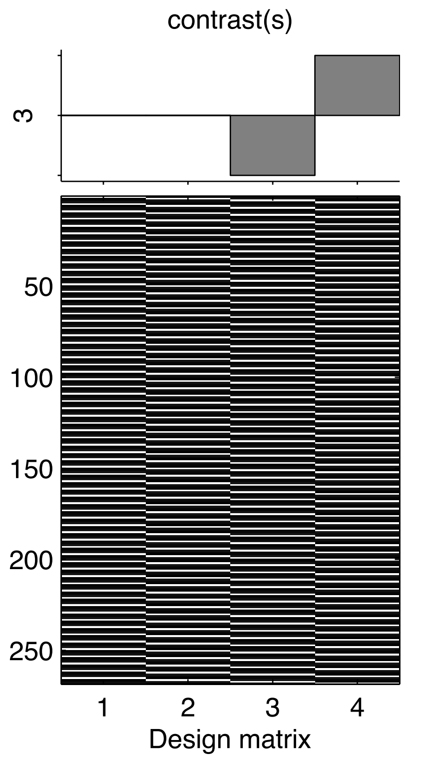
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.994)
Extent threshold: k = 0 voxels, p = 1.000 (0.994)
Expected voxels per cluster, <k> = 37.407
Expected number of clusters, <c> = 5.19
FWEp: 4.596, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 14.0 13.9 13.3 mm mm mm; 7.0 7.0 6.7 {voxels}
Volume: 1270464 = 158808 voxels = 451.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 324.37 voxels)

real_post1>pre





SPMresults: ./sl2014/2ses2run_ant+>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

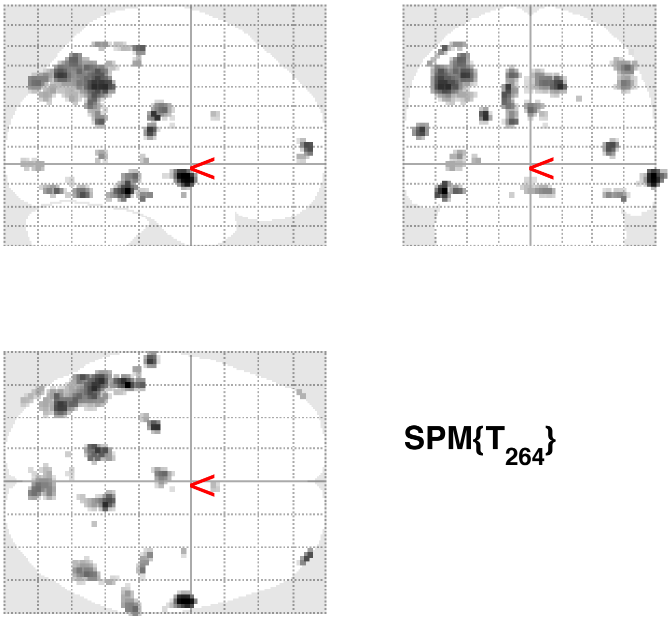
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.154	8	0.790	0.898	37	0.301	0.160	0.303	4.26	4.19	0.000	20 −36 46
		0.635	0.898	59	0.194	0.751	0.908	3.62	3.57	0.000	−58 6 34
		0.921	0.898	17	0.489	0.858	0.908	3.50	3.46	0.000	−30 −36 44
		0.961	0.898	9	0.626	0.913	0.908	3.42	3.38	0.000	60 4 40
		0.981	0.898	4	0.762	0.977	0.908	3.25	3.22	0.001	−40 −52 16
		0.990	0.898	1	0.898	0.982	0.908	3.23	3.19	0.001	62 10 34
		0.987	0.898	2	0.842	0.985	0.908	3.21	3.18	0.001	−26 −52 28
		0.987	0.898	2	0.842	0.991	0.919	3.16	3.12	0.001	4 4 60

table shows 3 local maxima more than 8.0mm apart

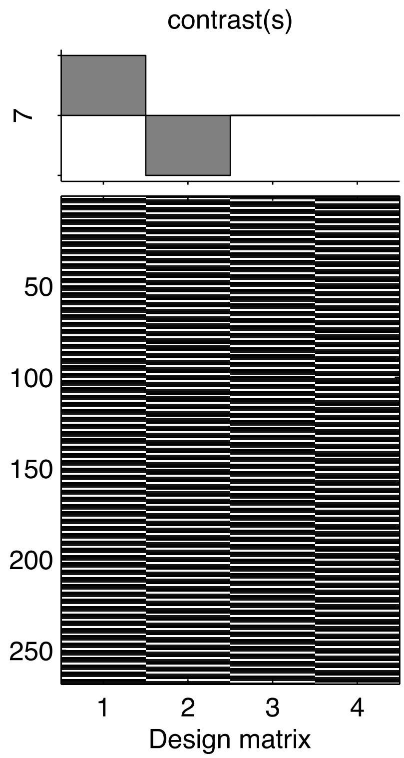
Height threshold: T = 3.12, p = 0.001 (0.994)
Extent threshold: k = 0 voxels, p = 1.000 (0.994)
Expected voxels per cluster, <k> = 37.407
Expected number of clusters, <c> = 5.19
FWEp: 4.596, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 14.0 13.9 13.3 mm mm mm; 7.0 7.0 6.7 {voxels}
Volume: 1270464 = 158808 voxels = 451.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 324.37 voxels)

sham_post1<pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_ant+>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p–values adjusted for search volume*

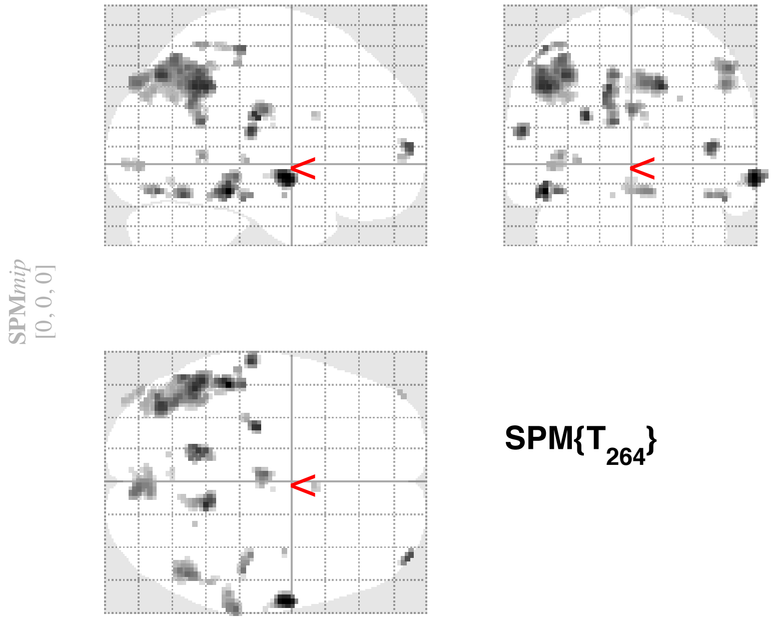
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.000	**30**	**0.635**	**0.816**	**59**	**0.194**	**0.132**	**0.471**	**4.32**	**4.24**	**0.000**	**-48 -36 -16**
						0.981	0.859	3.23	3.20	0.001	-46 -46 -20
		0.576	**0.816**	**68**	**0.165**	**0.133**	**0.471**	**4.32**	**4.24**	**0.000**	**64 -6 -8**
						0.993	0.983	3.14	3.11	0.001	68 -16 -8
		0.502	**0.806**	**80**	**0.134**	**0.293**	**0.471**	**4.06**	**4.00**	**0.000**	**14 -48 38**
						0.972	0.818	3.27	3.24	0.001	12 -58 44
						0.976	0.840	3.25	3.22	0.001	10 -60 36
		0.002	**0.011**	**627**	**0.000**	**0.298**	**0.471**	**4.06**	**3.99**	**0.000**	**-46 -54 38**
						0.371	0.471	3.97	3.91	0.000	-38 -72 44
						0.500	0.471	3.85	3.79	0.000	-50 -52 46
		0.915	**0.816**	**18**	**0.476**	**0.312**	**0.471**	**4.04**	**3.98**	**0.000**	**-26 -20 22**
		0.811	**0.816**	**34**	**0.322**	**0.363**	**0.471**	**3.98**	**3.92**	**0.000**	**-60 -24 16**
		0.210	**0.566**	**153**	**0.045**	**0.369**	**0.471**	**3.98**	**3.91**	**0.000**	**-14 -52 38**
						0.553	0.471	3.80	3.75	0.000	-12 -50 20
		0.910	**0.816**	**19**	**0.463**	**0.460**	**0.471**	**3.89**	**3.83**	**0.000**	**42 60 8**
		0.891	**0.816**	**22**	**0.428**	**0.485**	**0.471**	**3.86**	**3.81**	**0.000**	**-52 -60 -18**
		0.879	**0.816**	**24**	**0.407**	**0.551**	**0.471**	**3.80**	**3.75**	**0.000**	**-48 -28 58**
						0.894	0.756	3.45	3.41	0.000	-56 -30 50
						0.959	0.793	3.31	3.28	0.001	-46 -38 58
		0.921	**0.816**	**17**	**0.489**	**0.567**	**0.471**	**3.79**	**3.73**	**0.000**	**-42 -74 -16**
		0.733	**0.816**	**45**	**0.255**	**0.616**	**0.471**	**3.74**	**3.69**	**0.000**	**68 -32 -8**
						0.871	0.710	3.48	3.44	0.000	60 -36 -10

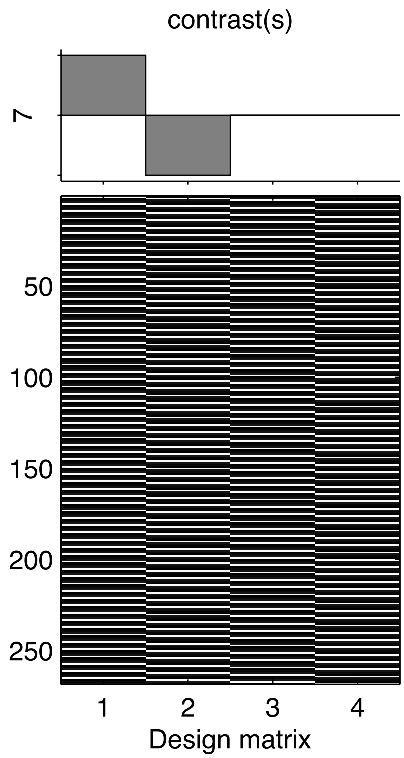
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.994)
Extent threshold: k = 0 voxels, p = 1.000 (0.994)
Expected voxels per cluster, <k> = 37.407
Expected number of clusters, <c> = 5.19
FWEp: 4.596, FDRp: Inf, FWEc: 627, FDRc: 627

Degrees of freedom = [1.0, 264.0]
FWHM = 14.0 13.9 13.3 mm mm mm; 7.0 7.0 6.7 {voxels}
Volume: 1270464 = 158808 voxels = 451.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 324.37 voxels)

sham_post1<pre





SPMresults: ./sl2014/2ses2run_ant+>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p–values adjusted for search volume*

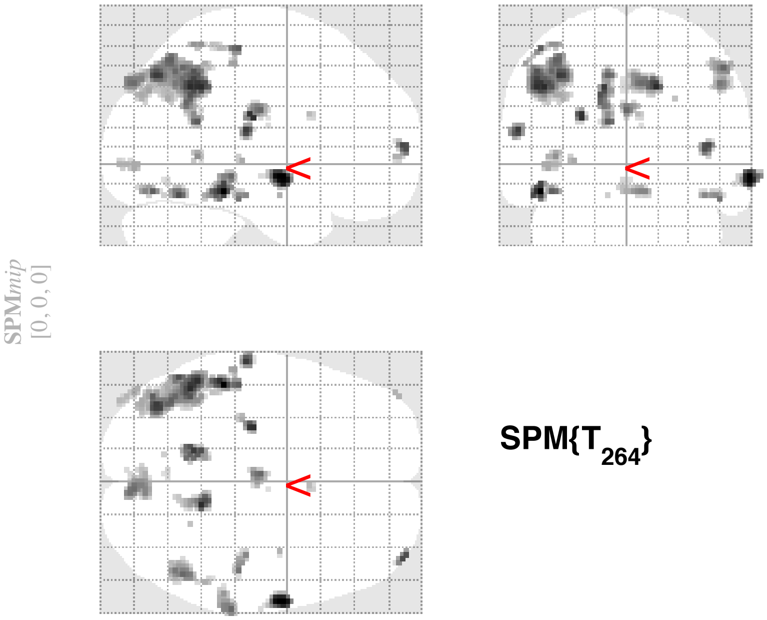
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.254	**0.566**	**137**	**0.057**	**0.619**	**0.471**	**3.74**	**3.69**	**0.000**	**50 −58 48**
						0.713	0.542	3.66	3.61	0.000	48 −62 40
						0.957	0.793	3.32	3.28	0.001	44 −64 48
		0.769	**0.816**	**40**	**0.282**	**0.621**	**0.471**	**3.74**	**3.69**	**0.000**	**−2 −16 26**
		0.431	**0.806**	**93**	**0.109**	**0.653**	**0.494**	**3.71**	**3.66**	**0.000**	**6 −84 40**
						0.991	0.954	3.16	3.13	0.001	−4 −88 40
		0.898	**0.816**	**21**	**0.439**	**0.693**	**0.532**	**3.67**	**3.62**	**0.000**	**48 −28 −20**
						0.801	0.633	3.57	3.52	0.000	40 −24 −18
		0.769	**0.816**	**40**	**0.282**	**0.778**	**0.609**	**3.59**	**3.55**	**0.000**	**6 −78 −16**
						0.962	0.793	3.31	3.27	0.001	−4 −80 −14
		0.942	**0.869**	**13**	**0.550**	**0.835**	**0.680**	**3.53**	**3.48**	**0.000**	**−40 −50 2**
		0.961	**0.898**	**9**	**0.626**	**0.848**	**0.680**	**3.51**	**3.47**	**0.000**	**−42 −48 60**
		0.872	**0.816**	**25**	**0.397**	**0.916**	**0.758**	**3.41**	**3.37**	**0.000**	**−44 −84 −4**
						0.949	0.784	3.34	3.31	0.000	−40 −92 −2
		0.977	**0.898**	**5**	**0.729**	**0.919**	**0.758**	**3.41**	**3.37**	**0.000**	**−30 −26 0**
		0.970	**0.898**	**7**	**0.673**	**0.933**	**0.781**	**3.38**	**3.34**	**0.000**	**54 −46 50**
		0.981	**0.898**	**4**	**0.762**	**0.942**	**0.784**	**3.36**	**3.32**	**0.000**	**−42 58 2**
		0.987	**0.898**	**2**	**0.842**	**0.944**	**0.784**	**3.36**	**3.32**	**0.000**	**38 −6 −18**
		0.974	**0.898**	**6**	**0.700**	**0.960**	**0.793**	**3.31**	**3.28**	**0.001**	**4 10 24**
		0.990	**0.898**	**1**	**0.898**	**0.971**	**0.818**	**3.28**	**3.24**	**0.001**	**24 −54 32**
		0.990	**0.898**	**1**	**0.898**	**0.985**	**0.892**	**3.21**	**3.18**	**0.001**	**−12 −68 −18**
		0.977	**0.898**	**5**	**0.729**	**0.987**	**0.910**	**3.19**	**3.16**	**0.001**	**−4 −66 −12**

table shows 3 local maxima more than 8.0mm apart

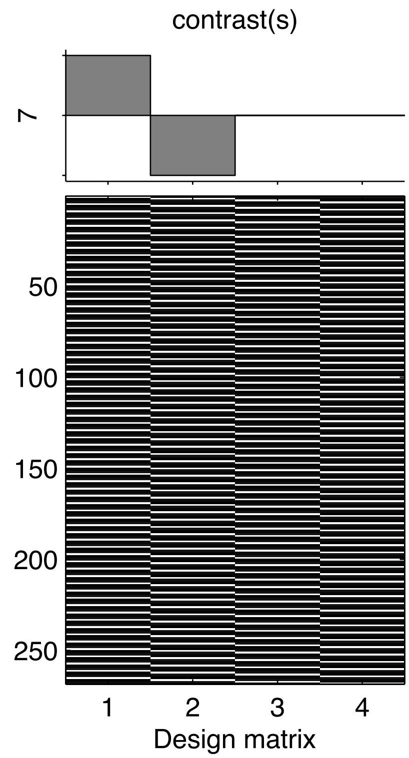
Height threshold: T = 3.12, p = 0.001 (0.994)
Extent threshold: k = 0 voxels, p = 1.000 (0.994)
Expected voxels per cluster, <k> = 37.407
Expected number of clusters, <c> = 5.19
FWEp: 4.596, FDRp: Inf, FWEc: 627, FDRc: 627

Degrees of freedom = [1.0, 264.0]
FWHM = 14.0 13.9 13.3 mm mm mm; 7.0 7.0 6.7 {voxels}
Volume: 1270464 = 158808 voxels = 451.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 324.37 voxels)

sham_post1<pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_ant+>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

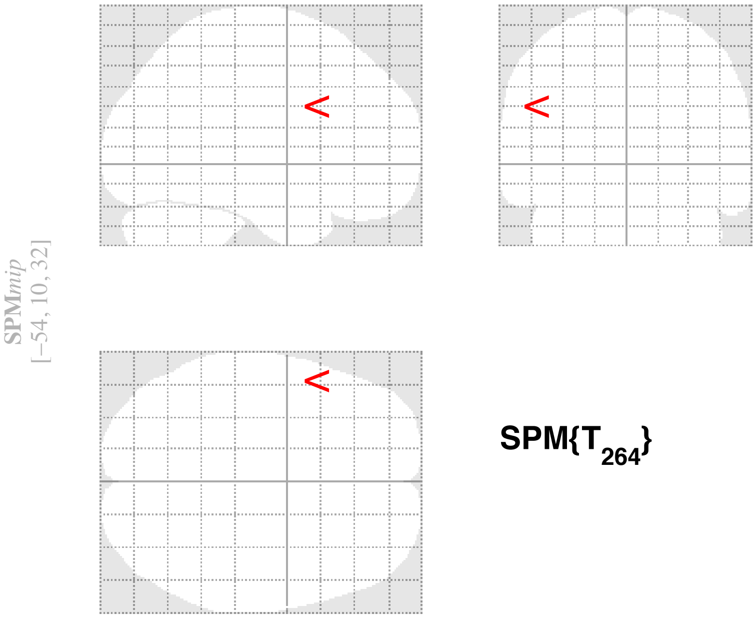
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.990	0.898	1	0.898	0.993	0.983	3.14	3.10	0.001	52 −28 56
		0.990	0.898	1	0.898	0.994	0.996	3.12	3.09	0.001	6 −12 18

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.994)
Extent threshold: k = 0 voxels, p = 1.000 (0.994)
Expected voxels per cluster, <k> = 37.407
Expected number of clusters, <c> = 5.19
FWEp: 4.596, FDRp: Inf, FWEc: 627, FDRc: 627

Degrees of freedom = [1.0, 264.0]
FWHM = 14.0 13.9 13.3 mm mm mm; 7.0 7.0 6.7 {voxels}
Volume: 1270464 = 158808 voxels = 451.6 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 324.37 voxels)

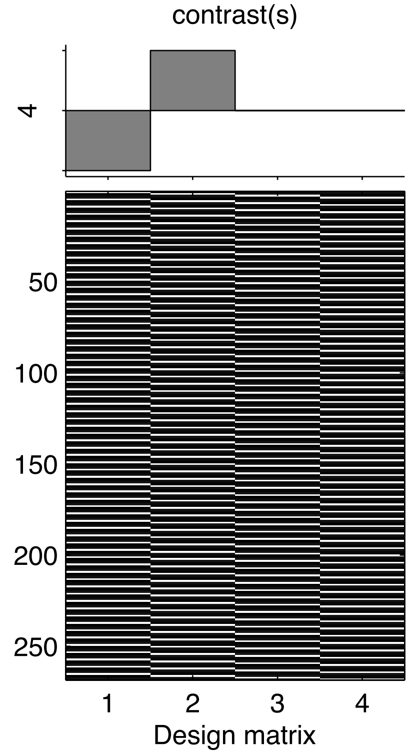
sham_post1>pre



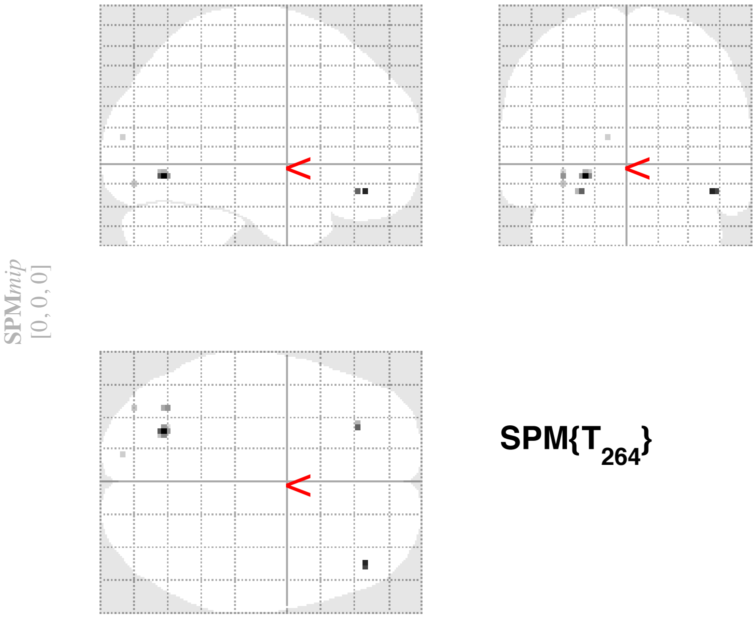
SPMresults: ./sl2014/2ses2run_ant+>ant0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

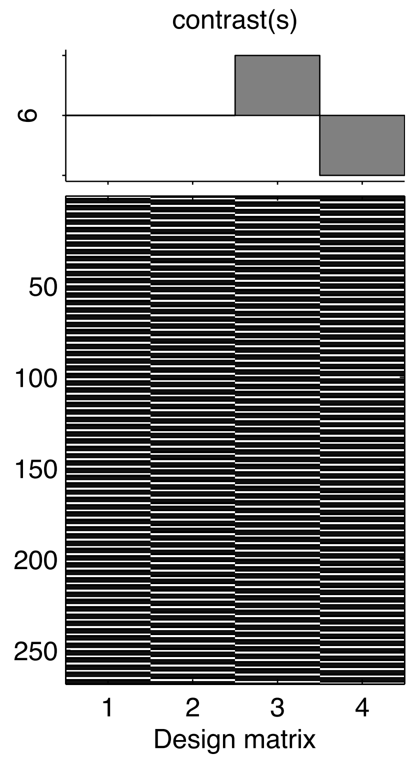
Extent threshold k = 0 voxels



real_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_ant+>out+win_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

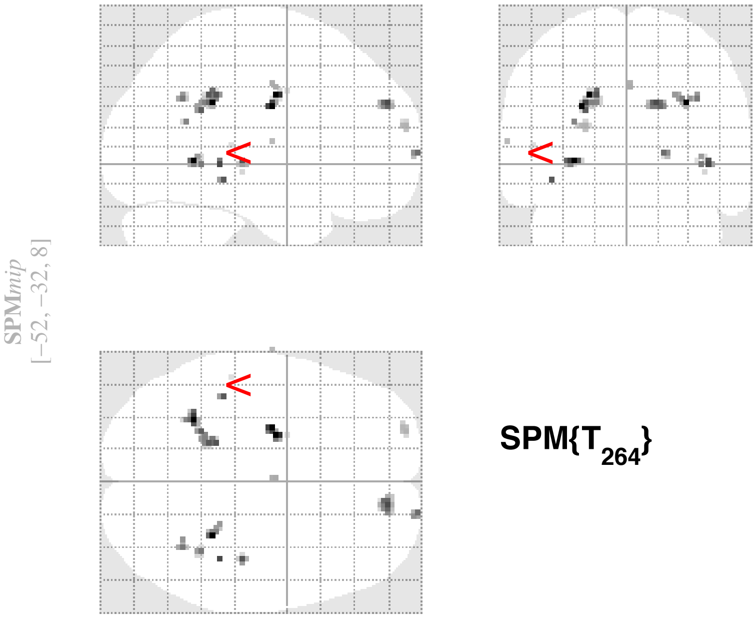
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.620	6	0.972	0.881	10	0.557	0.914	0.920	3.50	3.45	0.000	-24 -68 -8
		0.995	0.881	2	0.818	0.948	0.920	3.43	3.39	0.000	44 40 -16
		0.995	0.881	2	0.818	0.979	0.920	3.33	3.29	0.000	-26 36 -16
		0.993	0.881	3	0.769	0.990	0.920	3.25	3.22	0.001	-36 -66 -8
		0.997	0.881	1	0.881	0.996	0.920	3.18	3.14	0.001	-36 -84 -12
		0.997	0.881	1	0.881	0.997	0.920	3.16	3.12	0.001	-12 -90 12

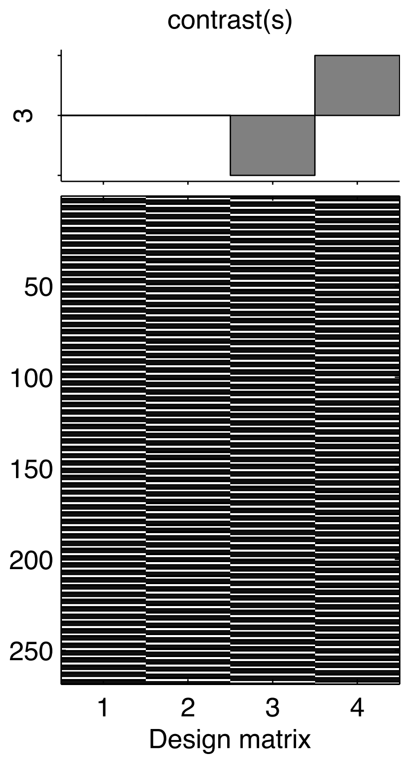
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.627
Expected number of clusters, <c> = 6.42
FWEp: 4.653, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 12.9 12.3 mm mm mm; 6.5 6.4 6.1 {voxels}
Volume: 1270464 = 158808 voxels = 570.1 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 256.91 voxels)

real_post1>pre





SPM{T_{264}}

SPMresults: ./2ses2run_ant+>out+win_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

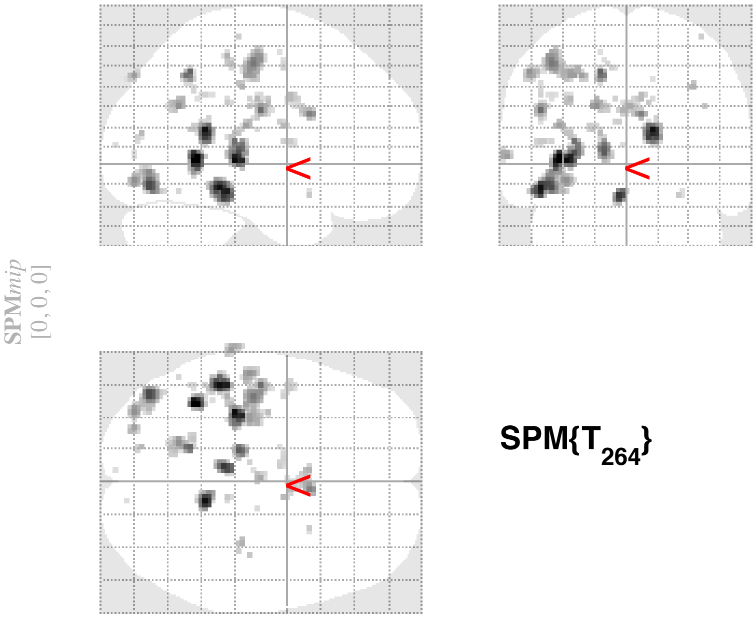
set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.000	18	0.964	0.881	12	0.516	0.807	0.909	3.63	3.59	0.000	30 −42 30
						0.987	0.909	3.28	3.24	0.001	24 −38 34
		0.949	0.881	15	0.464	0.820	0.909	3.62	3.57	0.000	−22 −8 34
		0.954	0.881	14	0.480	0.823	0.909	3.62	3.57	0.000	−30 −52 0
		0.995	0.881	2	0.818	0.935	0.909	3.46	3.41	0.000	42 −38 −2
		0.858	0.881	29	0.304	0.936	0.909	3.45	3.41	0.000	14 52 30
		0.880	0.881	26	0.330	0.945	0.909	3.43	3.39	0.000	−18 −40 34
						0.954	0.909	3.41	3.37	0.000	−24 −48 26
		0.991	0.881	4	0.727	0.945	0.909	3.43	3.39	0.000	42 −26 0
		0.995	0.881	2	0.818	0.950	0.909	3.42	3.38	0.000	−42 −36 −10
		0.985	0.881	6	0.659	0.965	0.909	3.38	3.34	0.000	18 68 4
		0.985	0.881	6	0.659	0.972	0.909	3.35	3.32	0.000	38 −48 −2
		0.983	0.881	7	0.630	0.974	0.909	3.35	3.31	0.000	36 −58 32
		0.995	0.881	2	0.818	0.979	0.909	3.33	3.29	0.001	−30 −56 20
		0.995	0.881	2	0.818	0.991	0.917	3.24	3.21	0.001	0 −8 38
		0.976	0.881	9	0.579	0.994	0.919	3.22	3.19	0.001	−24 62 18
		0.997	0.881	1	0.881	0.995	0.919	3.21	3.17	0.001	−66 −10 10
		0.997	0.881	1	0.881	0.998	0.986	3.14	3.11	0.001	40 −26 −6
		0.997	0.881	1	0.881	0.998	0.986	3.13	3.10	0.001	−22 −2 36
		0.997	0.881	1	0.881	0.998	0.986	3.13	3.10	0.001	−52 −32 8

table shows 3 local maxima more than 8.0mm apart

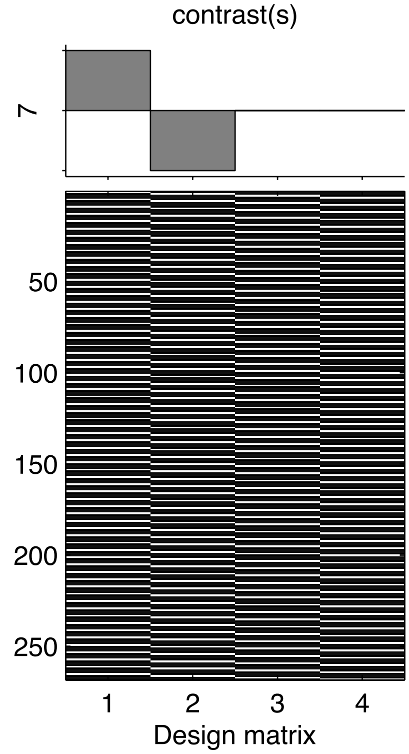
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.627
Expected number of clusters, <c> = 6.42
FWEp: 4.653, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 12.9 12.3 mm mm mm; 6.5 6.4 6.1 {voxels}
Volume: 1270464 = 158808 voxels = 570.1 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 256.91 voxels)

sham_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_ant+>out+win_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p-values adjusted for search volume*

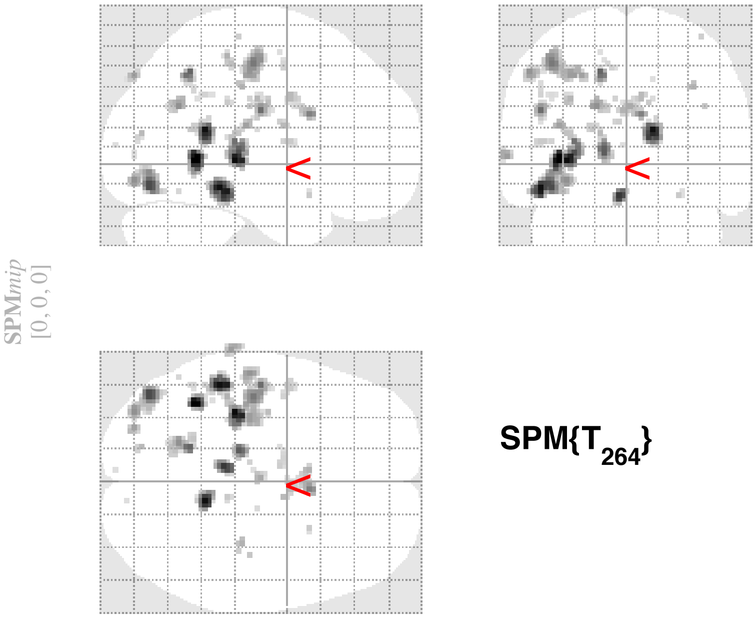
set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_\equiv)$	p_{uncorr}	
0.000	42	0.597	0.881	61	0.141	0.067	0.285	4.57	4.48	0.000	-38 -52 0
		0.376	0.855	94	0.074	0.106	0.285	4.45	4.36	0.000	-34 -30 0
						0.609	0.755	3.82	3.77	0.000	-30 -30 10
						0.909	0.985	3.50	3.46	0.000	-38 -24 18
		0.453	0.855	81	0.094	0.110	0.285	4.43	4.35	0.000	12 -46 16
		0.480	0.855	77	0.102	0.112	0.285	4.43	4.35	0.000	-48 -38 -14
		0.778	0.881	39	0.234	0.250	0.396	4.18	4.11	0.000	-6 -36 -18
		0.250	0.855	122	0.045	0.367	0.551	4.05	3.98	0.000	-42 -76 -14
						0.816	0.946	3.63	3.58	0.000	-34 -84 -10
		0.727	0.881	45	0.202	0.468	0.677	3.95	3.89	0.000	-14 -28 4
		0.908	0.881	22	0.371	0.533	0.736	3.89	3.83	0.000	-16 -54 46
		0.811	0.881	35	0.259	0.583	0.755	3.84	3.79	0.000	-48 -16 26
						0.998	0.985	3.14	3.10	0.001	-48 -22 20
		0.195	0.855	139	0.034	0.666	0.814	3.77	3.72	0.000	-42 -20 50
						0.880	0.985	3.55	3.50	0.000	-30 -22 44
		0.669	0.881	52	0.172	0.734	0.912	3.71	3.66	0.000	6 10 24
						0.956	0.985	3.41	3.37	0.000	-4 10 26
						0.971	0.985	3.36	3.32	0.000	6 0 32
		0.835	0.881	32	0.280	0.829	0.946	3.61	3.56	0.000	-18 -60 28
		0.819	0.881	34	0.266	0.856	0.984	3.58	3.53	0.000	-54 -22 46
		0.908	0.881	22	0.371	0.888	0.985	3.54	3.49	0.000	-66 -32 2
		0.972	0.881	10	0.557	0.905	0.985	3.51	3.47	0.000	-26 -84 44

table shows 3 local maxima more than 8.0mm apart

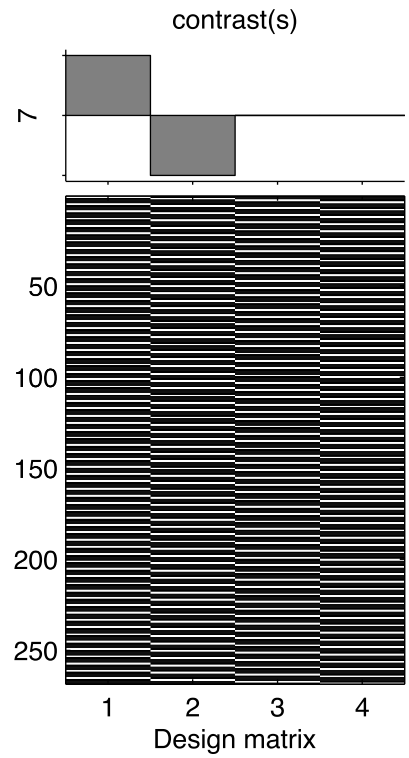
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.627
Expected number of clusters, <c> = 6.42
FWEp: 4.653, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 12.9 12.3 mm mm mm; 6.5 6.4 6.1 {voxels}
Volume: 1270464 = 158808 voxels = 570.1 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 256.91 voxels)

sham_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_ant+>out+win_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p-values adjusted for search volume*

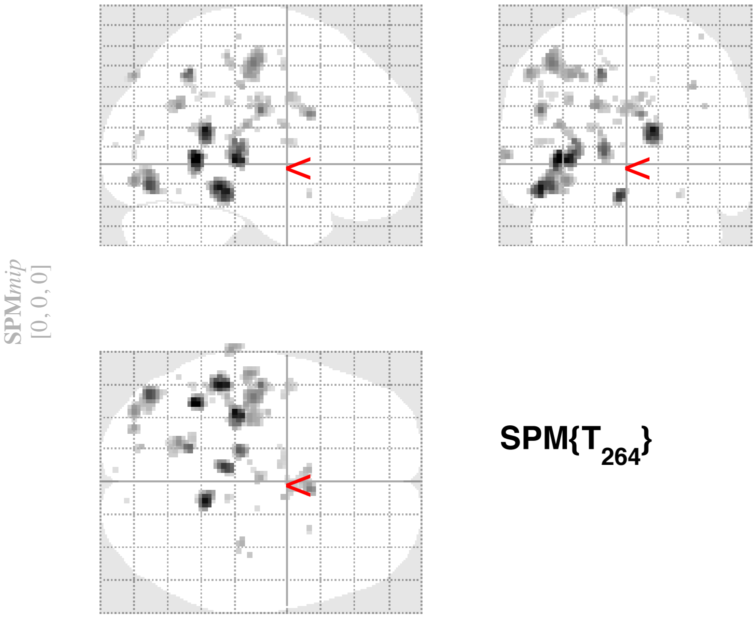
set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.964	0.881	12	0.516	0.929	0.985	3.47	3.43	0.000	0 -16 28
		0.991	0.881	4	0.727	0.953	0.985	3.41	3.37	0.000	34 -26 38
		0.944	0.881	16	0.449	0.957	0.985	3.40	3.36	0.000	-42 -34 54
		0.972	0.881	10	0.557	0.959	0.985	3.40	3.36	0.000	-32 -18 32
		0.993	0.881	3	0.769	0.973	0.985	3.35	3.31	0.000	10 -4 18
		0.988	0.881	5	0.691	0.974	0.985	3.35	3.31	0.000	-16 -80 14
		0.983	0.881	7	0.630	0.985	0.985	3.29	3.26	0.001	-20 -52 16
		0.997	0.881	1	0.881	0.988	0.985	3.27	3.24	0.001	40 -22 28
		0.968	0.881	11	0.536	0.989	0.985	3.26	3.23	0.001	-48 -2 10
		0.993	0.881	3	0.769	0.990	0.985	3.26	3.22	0.001	10 -34 30
		0.993	0.881	3	0.769	0.991	0.985	3.25	3.22	0.001	26 10 -18
		0.997	0.881	1	0.881	0.991	0.985	3.25	3.21	0.001	38 -28 64
		0.991	0.881	4	0.727	0.992	0.985	3.24	3.21	0.001	-6 -6 20
		0.997	0.881	1	0.881	0.994	0.985	3.21	3.18	0.001	-48 -46 34
		0.997	0.881	1	0.881	0.995	0.985	3.21	3.17	0.001	-8 -22 32
		0.991	0.881	4	0.727	0.995	0.985	3.21	3.17	0.001	-10 -4 48
		0.997	0.881	1	0.881	0.996	0.985	3.19	3.15	0.001	-52 -60 -16
		0.993	0.881	3	0.769	0.997	0.985	3.17	3.14	0.001	-48 -52 36
		0.991	0.881	4	0.727	0.997	0.985	3.17	3.14	0.001	-42 -46 34
		0.997	0.881	1	0.881	0.997	0.985	3.15	3.12	0.001	16 -18 16
		0.995	0.881	2	0.818	0.998	0.985	3.14	3.11	0.001	-46 -52 46
		0.995	0.881	2	0.818	0.998	0.985	3.14	3.11	0.001	-38 -84 4

table shows 3 local maxima more than 8.0mm apart

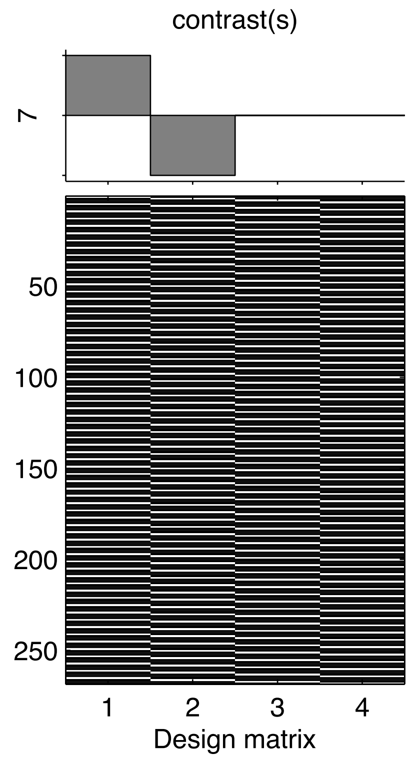
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.627
Expected number of clusters, <c> = 6.42
FWEp: 4.653, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 12.9 12.3 mm mm mm; 6.5 6.4 6.1 {voxels}
Volume: 1270464 = 158808 voxels = 570.1 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 256.91 voxels)

sham_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_ant+>out+win_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

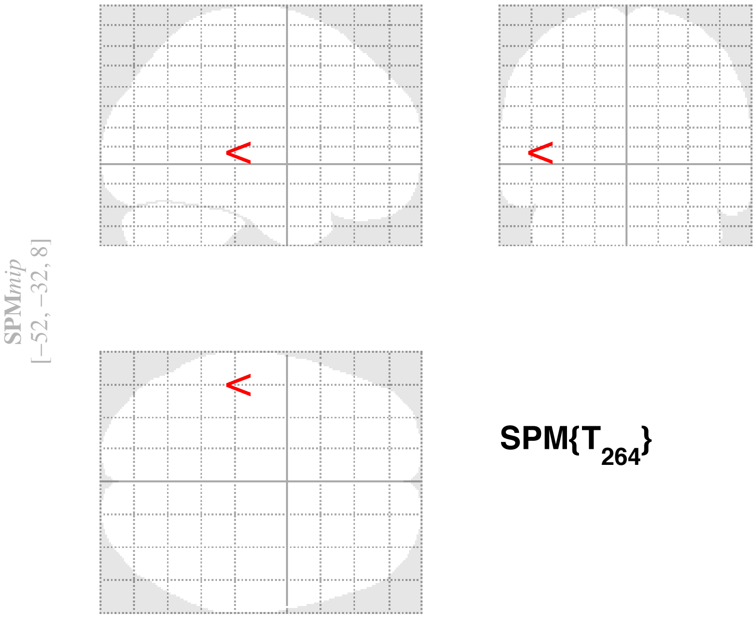
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_\equiv)$	p_{uncorr}	
		0.997	0.881	1	0.881	0.998	0.985	3.14	3.11	0.001	-42 -50 32
		0.997	0.881	1	0.881	0.998	0.985	3.13	3.10	0.001	-16 -6 56
		0.997	0.881	1	0.881	0.998	0.985	3.13	3.10	0.001	-40 -42 34
		0.997	0.881	1	0.881	0.998	0.985	3.13	3.10	0.001	-4 -94 8
		0.997	0.881	1	0.881	0.998	0.985	3.13	3.10	0.001	12 -88 42

table shows 3 local maxima more than 8.0mm apart

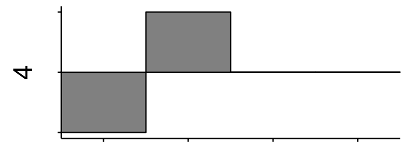
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.627
Expected number of clusters, <c> = 6.42
FWEp: 4.653, FDRp: Inf, FWEc: Inf, FDRc: Inf

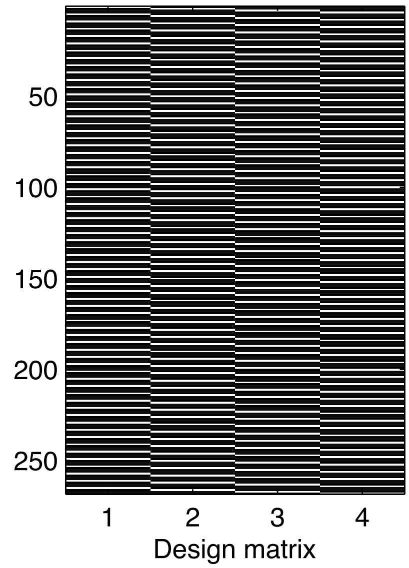
Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 12.9 12.3 mm mm mm; 6.5 6.4 6.1 {voxels}
Volume: 1270464 = 158808 voxels = 570.1 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 256.91 voxels)

sham_post1>pre



SPM{T_{264}}





SPMresults: ./2ses2run_ant+>out+win_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

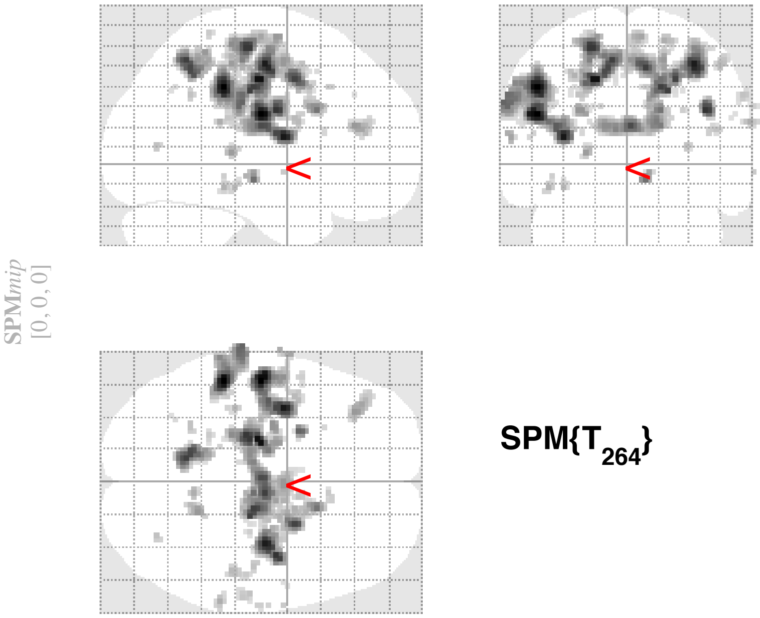
no suprathreshold clusters

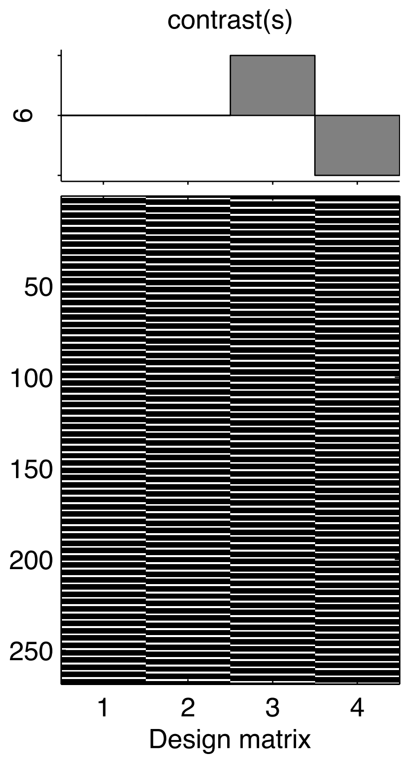
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.627
Expected number of clusters, <c> = 6.42
FWEp: 4.653, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 12.9 12.3 mm mm mm; 6.5 6.4 6.1 {voxels}
Volume: 1270464 = 158808 voxels = 570.1 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 256.91 voxels)

real_post1<pre





SPMresults: ./2ses2run_out−nl>out−lose_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p−values adjusted for search volume*

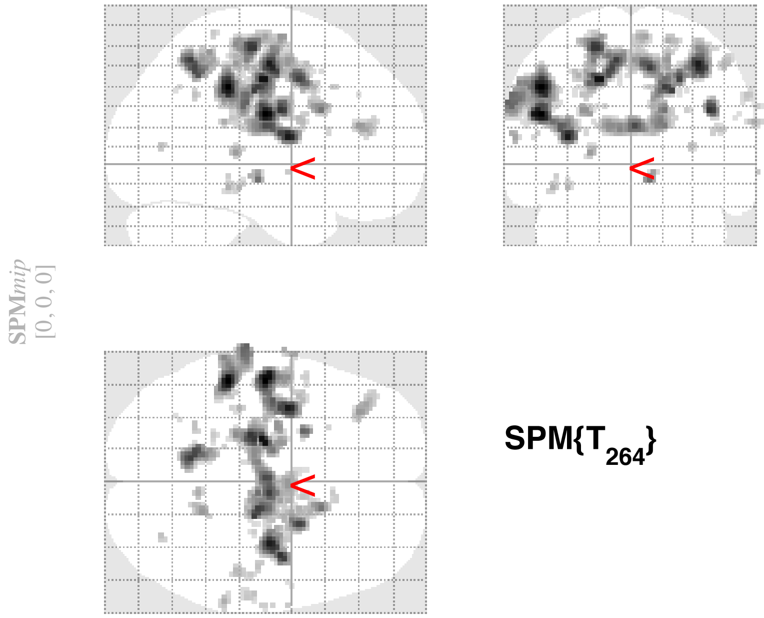
set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.000	**48**	**0.004**	**0.010**	**461**	**0.001**	**0.080**	**0.661**	**4.52**	**4.43**	**0.000**	**−50 −16 24**
						0.148	0.661	4.34	4.26	0.000	−36 −4 12
						0.486	0.865	3.92	3.86	0.000	−40 −12 16
		0.003	**0.010**	**504**	**0.000**	**0.095**	**0.661**	**4.47**	**4.38**	**0.000**	**−50 −36 38**
						0.543	0.890	3.87	3.81	0.000	−68 −26 30
						0.768	0.908	3.66	3.61	0.000	−58 −36 40
		0.030	**0.059**	**284**	**0.005**	**0.127**	**0.661**	**4.38**	**4.30**	**0.000**	**−18 −16 42**
						0.272	0.661	4.14	4.07	0.000	−22 −24 58
						0.812	0.908	3.62	3.57	0.000	−22 −32 60
		0.000	**0.000**	**1324**	**0.000**	**0.163**	**0.661**	**4.31**	**4.23**	**0.000**	**34 −14 50**
						0.310	0.661	4.10	4.03	0.000	16 −20 38
						0.313	0.661	4.09	4.03	0.000	8 −14 48
		0.648	**0.884**	**55**	**0.168**	**0.265**	**0.661**	**4.15**	**4.08**	**0.000**	**40 −8 26**
		0.095	**0.155**	**194**	**0.016**	**0.327**	**0.661**	**4.08**	**4.01**	**0.000**	**−10 −56 52**
						0.877	0.908	3.54	3.49	0.000	−14 −46 56
		0.778	**0.884**	**39**	**0.243**	**0.537**	**0.890**	**3.87**	**3.82**	**0.000**	**−24 4 40**
						0.982	0.965	3.30	3.26	0.001	−26 6 50
		0.912	**0.884**	**21**	**0.392**	**0.616**	**0.890**	**3.80**	**3.75**	**0.000**	**8 −20 −10**
		0.625	**0.884**	**58**	**0.158**	**0.688**	**0.902**	**3.74**	**3.69**	**0.000**	**−14 −12 54**
						0.870	0.908	3.55	3.50	0.000	−18 −8 64
		0.918	**0.884**	**20**	**0.404**	**0.842**	**0.908**	**3.58**	**3.54**	**0.000**	**−28 −10 26**
		0.564	**0.884**	**66**	**0.134**	**0.863**	**0.908**	**3.56**	**3.51**	**0.000**	**−34 34 18**

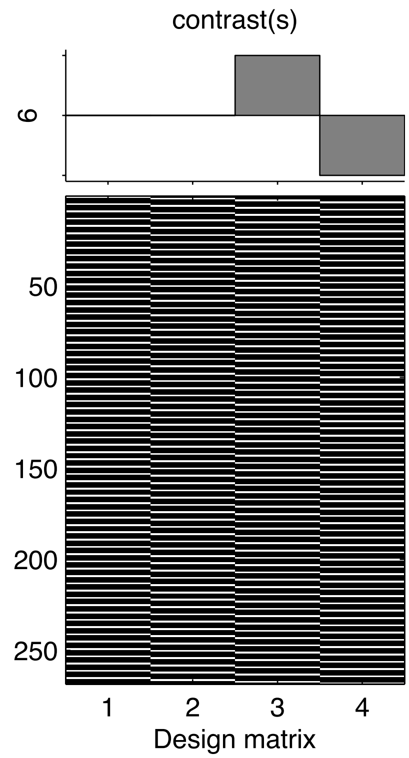
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.750
Expected number of clusters, <c> = 6.21
FWEp: 4.644, FDRp: Inf, FWEc: 284, FDRc: 461

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.5 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.64 voxels)

real_post1<pre





SPMresults: ./2ses2run_out–nl>out–lose_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

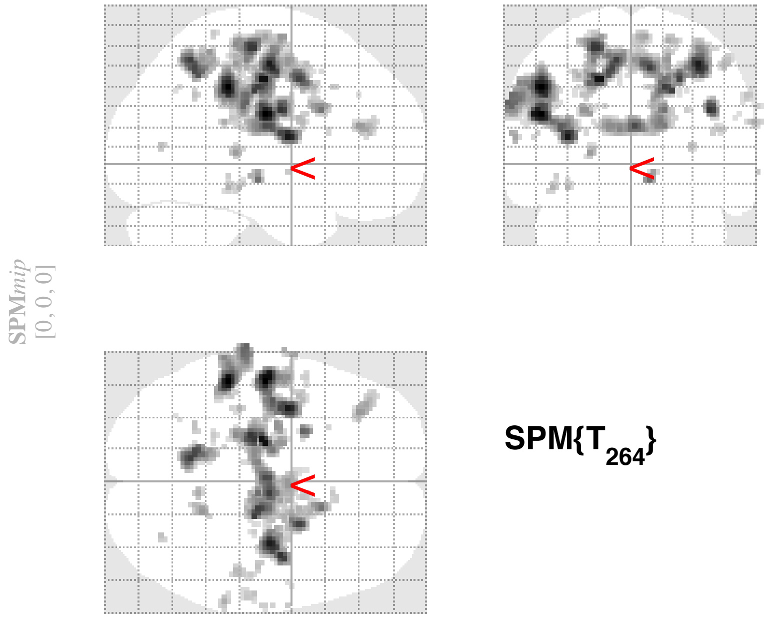
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
						0.961	0.913	3.38	3.34	0.000	-40 40 18
		0.794	0.884	37	0.255	0.868	0.908	3.55	3.51	0.000	18 -50 52
		0.957	0.884	13	0.506	0.888	0.908	3.52	3.48	0.000	-24 -32 4
		0.970	0.884	10	0.565	0.917	0.908	3.48	3.44	0.000	-64 0 12
		0.966	0.884	11	0.544	0.938	0.908	3.44	3.40	0.000	64 -38 20
		0.930	0.884	18	0.429	0.942	0.908	3.43	3.39	0.000	18 -18 62
		0.977	0.884	8	0.611	0.945	0.908	3.42	3.38	0.000	8 -52 44
		0.970	0.884	10	0.565	0.950	0.908	3.41	3.37	0.000	-44 -36 -14
		0.981	0.884	7	0.637	0.958	0.908	3.39	3.35	0.000	-36 -30 -14
		0.864	0.884	28	0.321	0.966	0.941	3.36	3.33	0.000	48 -32 50
						0.988	0.975	3.26	3.22	0.001	50 -24 52
		0.961	0.884	12	0.524	0.979	0.965	3.31	3.28	0.001	10 4 48
		0.924	0.884	19	0.416	0.980	0.965	3.31	3.27	0.001	60 -22 34
		0.977	0.884	8	0.611	0.980	0.965	3.31	3.27	0.001	46 -20 16
		0.981	0.884	7	0.637	0.980	0.965	3.31	3.27	0.001	-28 -54 34
		0.987	0.884	5	0.698	0.981	0.965	3.30	3.27	0.001	30 -72 8
		0.981	0.884	7	0.637	0.989	0.975	3.25	3.22	0.001	-22 -44 66
		0.984	0.884	6	0.666	0.989	0.975	3.25	3.21	0.001	8 20 38
		0.996	0.884	1	0.884	0.990	0.975	3.24	3.21	0.001	66 -4 -6
		0.992	0.884	3	0.774	0.990	0.975	3.24	3.21	0.001	66 -16 28
		0.994	0.884	2	0.822	0.991	0.975	3.23	3.20	0.001	28 -22 26
		0.992	0.884	3	0.774	0.992	0.975	3.23	3.19	0.001	42 -8 14

table shows 3 local maxima more than 8.0mm apart

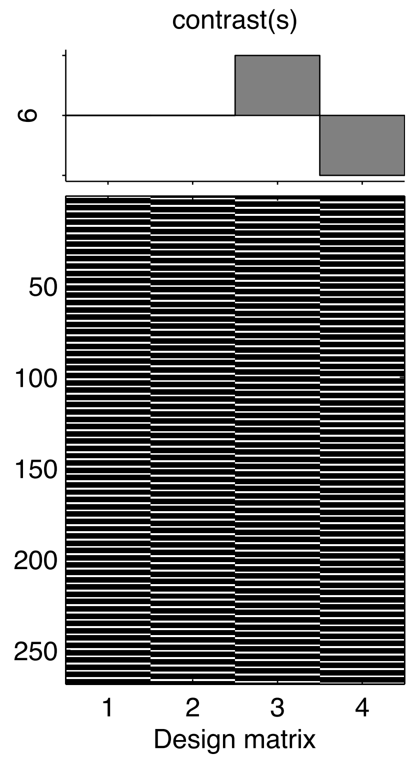
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.750
Expected number of clusters, <c> = 6.21
FWEp: 4.644, FDRp: Inf, FWEc: 284, FDRc: 461

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.5 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.64 voxels)

real_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_out–nl>out–lose_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

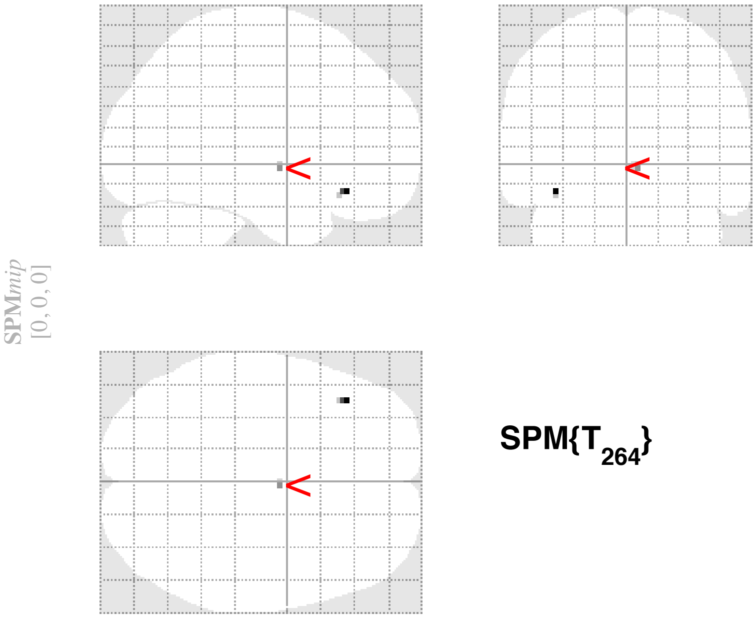
set–level		cluster–level				peak–level					mm mm mm		
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}			
		0.984	0.884	6	0.666	0.992	0.975	3.22	3.19	0.001	-52	6	24
		0.996	0.884	1	0.884	0.993	0.975	3.21	3.18	0.001	-16	-38	28
		0.996	0.884	1	0.884	0.994	0.975	3.20	3.17	0.001	66	-12	28
		0.994	0.884	2	0.822	0.994	0.975	3.19	3.16	0.001	-52	-8	14
		0.994	0.884	2	0.822	0.996	0.987	3.17	3.14	0.001	-26	18	14
		0.992	0.884	3	0.774	0.996	0.987	3.16	3.13	0.001	-8	-28	44
		0.996	0.884	1	0.884	0.997	0.987	3.16	3.13	0.001	-30	-62	38
		0.996	0.884	1	0.884	0.997	0.987	3.15	3.12	0.001	18	14	46
		0.996	0.884	1	0.884	0.997	0.987	3.15	3.12	0.001	-20	4	50
		0.996	0.884	1	0.884	0.997	0.987	3.14	3.11	0.001	-20	-4	28
		0.996	0.884	1	0.884	0.997	0.987	3.14	3.11	0.001	28	-4	26
		0.996	0.884	1	0.884	0.997	0.987	3.14	3.11	0.001	-32	-64	36
		0.996	0.884	1	0.884	0.998	0.987	3.14	3.10	0.001	22	-4	58
		0.996	0.884	1	0.884	0.998	0.987	3.13	3.10	0.001	-32	34	34
		0.996	0.884	1	0.884	0.998	0.987	3.13	3.10	0.001	54	-4	22
		0.996	0.884	1	0.884	0.998	0.987	3.13	3.10	0.001	28	-24	36
		0.996	0.884	1	0.884	0.998	0.998	3.12	3.09	0.001	56	-2	24

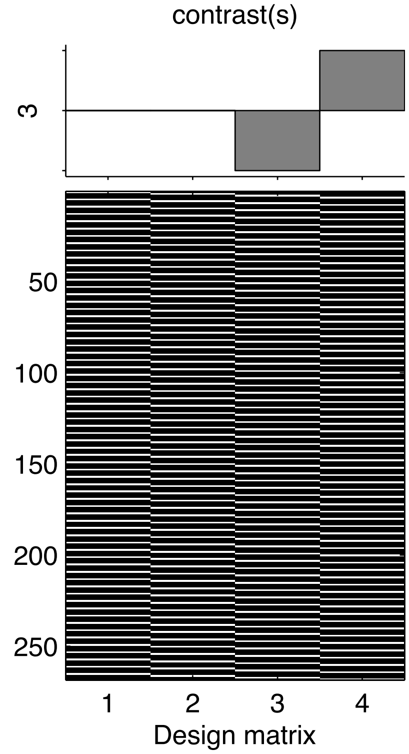
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.750
Expected number of clusters, <c> = 6.21
FWEp: 4.644, FDRp: Inf, FWEc: 284, FDRc: 461

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.5 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.64 voxels)

real_post1>pre





SPMresults: ./2ses2run_out–nl>out–lose_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p–values adjusted for search volume*

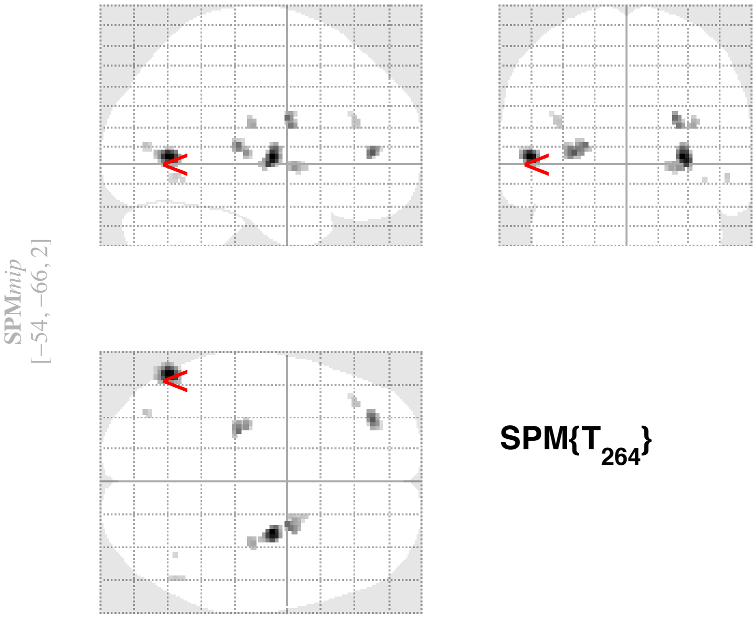
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.985	2	0.992	0.774	3	0.774	0.967	0.804	3.36	3.32	0.000	-40 30 -16
		0.989	0.774	4	0.733	0.993	0.804	3.21	3.18	0.001	4 -6 -4

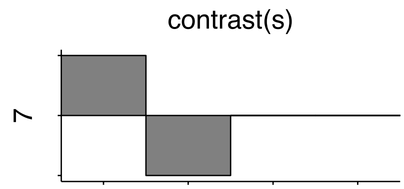
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.750
Expected number of clusters, <c> = 6.21
FWEp: 4.644, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.5 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.64 voxels)

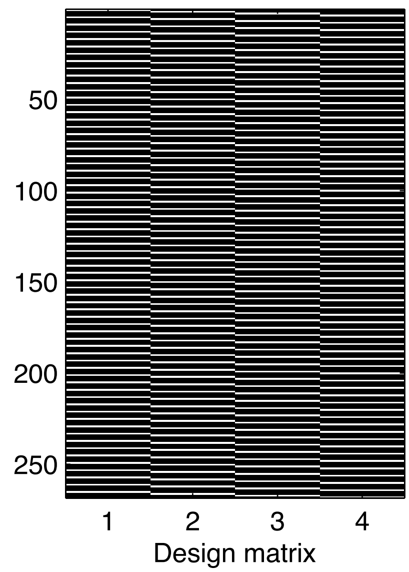
sham_post1<pre





$SPM\{T_{264}\}$

SPMresults: ./2ses2run_out−nl>out−lose_s
Height threshold T = 3.121388 {p<0.001 (unc.)}
Extent threshold k = 0 voxels



Statistics: *p-values adjusted for search volume*

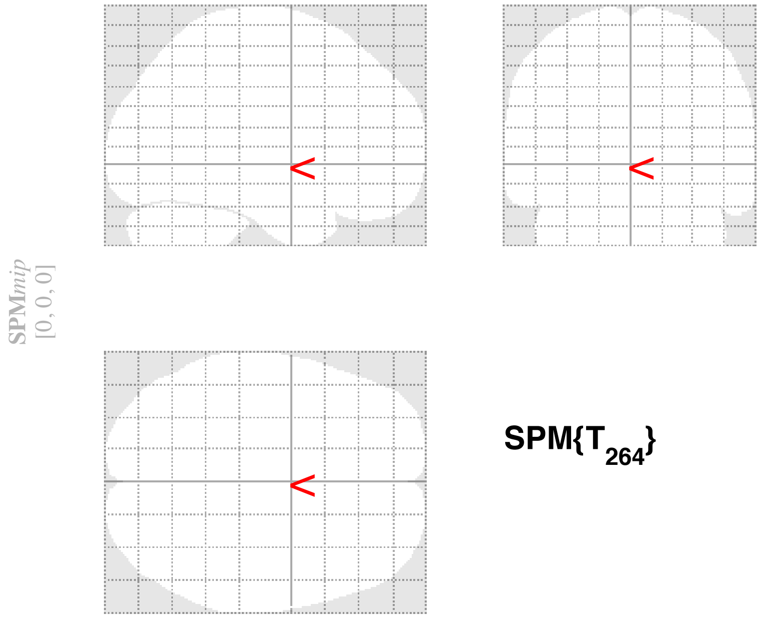
set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.025	12	0.461	0.837	81	0.100	0.302	0.508	4.11	4.04	0.000	−54 −66 2
		0.586	0.837	63	0.142	0.326	0.508	4.08	4.01	0.000	28 −10 2
		0.856	0.837	29	0.313	0.738	0.844	3.69	3.64	0.000	−30 44 4
		0.947	0.837	15	0.473	0.816	0.844	3.61	3.57	0.000	24 −2 22
		0.871	0.837	27	0.330	0.836	0.844	3.59	3.54	0.000	−24 −28 8
		0.899	0.837	23	0.369	0.935	0.870	3.44	3.40	0.000	26 2 −4
		0.977	0.837	8	0.611	0.966	0.870	3.36	3.33	0.000	34 −20 18
		0.987	0.837	5	0.698	0.989	0.898	3.25	3.22	0.001	−34 −78 8
		0.981	0.837	7	0.637	0.989	0.898	3.25	3.22	0.001	−38 36 20
		0.984	0.837	6	0.666	0.993	0.911	3.21	3.18	0.001	52 −62 −8
		0.996	0.884	1	0.884	0.997	0.975	3.16	3.13	0.001	40 −62 −10
		0.996	0.884	1	0.884	0.998	0.983	3.13	3.10	0.001	−42 32 24

table shows 3 local maxima more than 8.0mm apart

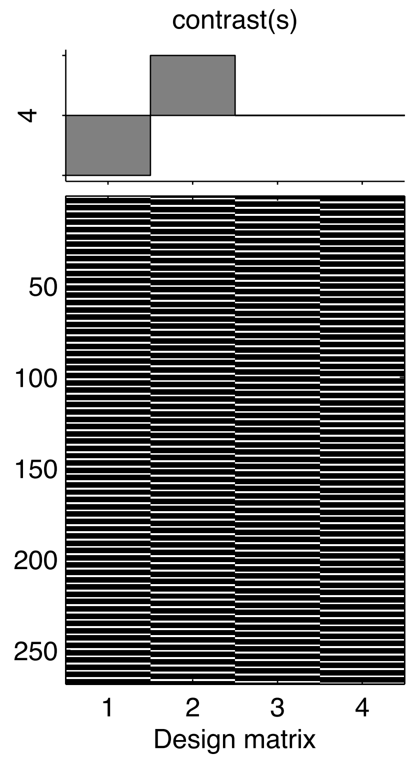
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.750
Expected number of clusters, <c> = 6.21
FWEp: 4.644, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.5 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.64 voxels)

sham_post1>pre



SPM{T_{264}}



SPMresults: ./2ses2run_out−nl>out−lose_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

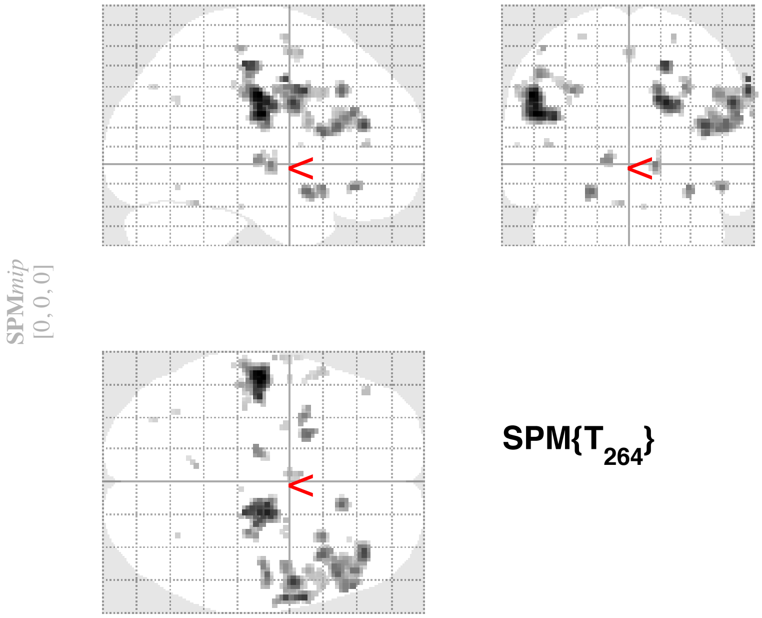
no suprathreshold clusters

table shows 3 local maxima more than 8.0mm apart

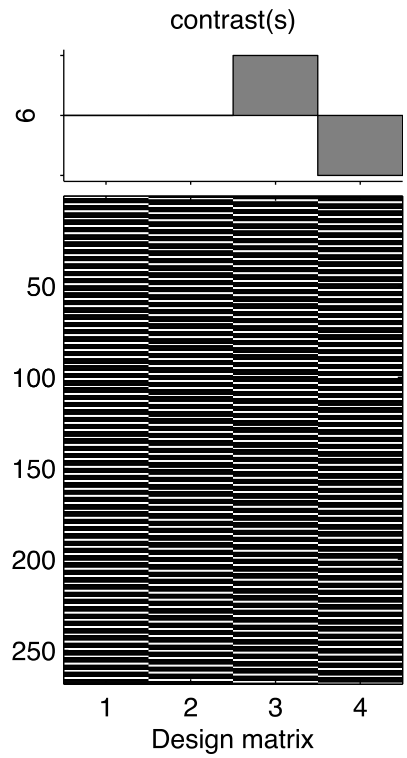
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.750
Expected number of clusters, <c> = 6.21
FWEp: 4.644, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.0 13.1 12.5 mm mm mm; 6.5 6.6 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.64 voxels)

real_post1<pre



SPM{T_{264}}



SPMresults: ./2ses3run_out−preventlose>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p−values adjusted for search volume*

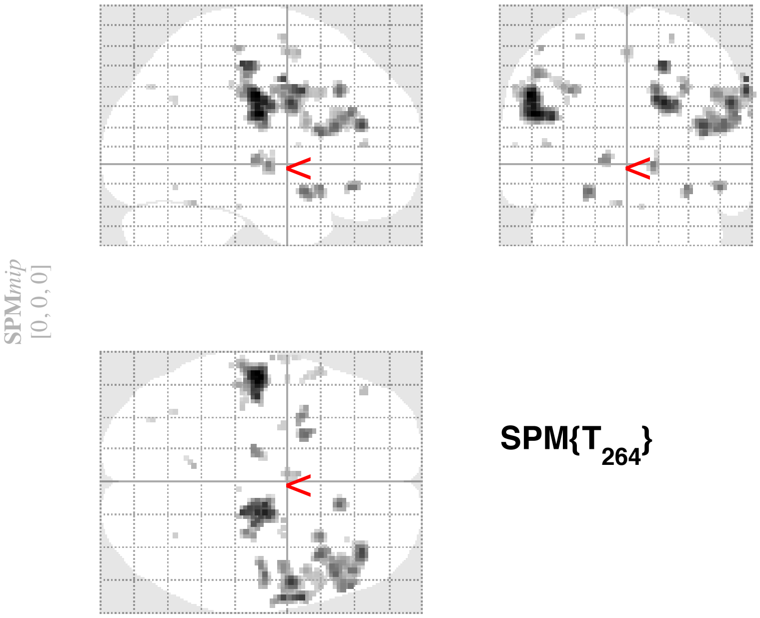
set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.000	**35**	**0.020**	**0.069**	**298**	**0.003**	**0.191**	**0.638**	**4.28**	**4.20**	**0.000**	**−54 −18 34**
						0.199	0.638	4.27	4.19	0.000	−52 −16 24
						0.388	0.638	4.03	3.97	0.000	−42 −18 22
		0.111	**0.154**	**174**	**0.018**	**0.339**	**0.638**	**4.08**	**4.02**	**0.000**	**18 −14 30**
						0.629	0.675	3.82	3.76	0.000	24 −20 30
						0.873	0.699	3.57	3.52	0.000	28 −24 38
		0.049	**0.088**	**232**	**0.008**	**0.483**	**0.638**	**3.94**	**3.88**	**0.000**	**54 0 30**
						0.489	0.638	3.94	3.88	0.000	62 6 36
						0.563	0.638	3.87	3.82	0.000	62 −4 42
		0.851	**0.878**	**30**	**0.286**	**0.490**	**0.638**	**3.94**	**3.88**	**0.000**	**18 −26 50**
		0.026	**0.069**	**279**	**0.004**	**0.550**	**0.638**	**3.88**	**3.83**	**0.000**	**38 38 18**
						0.710	0.699	3.74	3.69	0.000	50 24 18
						0.721	0.699	3.73	3.68	0.000	40 16 14
		0.794	**0.878**	**37**	**0.237**	**0.729**	**0.699**	**3.72**	**3.67**	**0.000**	**50 −14 20**
		0.882	**0.878**	**26**	**0.321**	**0.732**	**0.699**	**3.72**	**3.67**	**0.000**	**14 26 36**
		0.867	**0.878**	**28**	**0.303**	**0.748**	**0.699**	**3.71**	**3.66**	**0.000**	**−22 8 −16**
		0.916	**0.878**	**21**	**0.373**	**0.796**	**0.699**	**3.66**	**3.61**	**0.000**	**48 34 −14**
		0.929	**0.878**	**19**	**0.398**	**0.825**	**0.699**	**3.63**	**3.58**	**0.000**	**30 16 −14**
		0.916	**0.878**	**21**	**0.373**	**0.826**	**0.699**	**3.63**	**3.58**	**0.000**	**12 −12 −2**
		0.910	**0.878**	**22**	**0.362**	**0.851**	**0.699**	**3.60**	**3.55**	**0.000**	**−32 6 36**
		0.935	**0.878**	**18**	**0.411**	**0.883**	**0.699**	**3.56**	**3.51**	**0.000**	**−14 −20 0**
		0.992	**0.878**	**4**	**0.721**	**0.952**	**0.796**	**3.43**	**3.39**	**0.000**	**−48 −28 58**

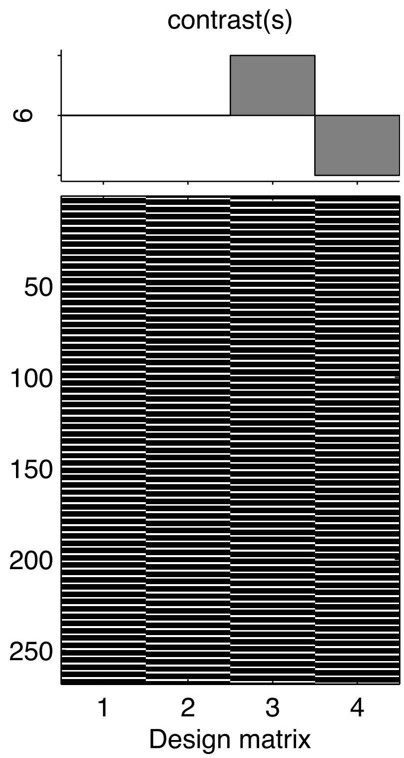
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.999)
Extent threshold: k = 0 voxels, p = 1.000 (0.999)
Expected voxels per cluster, <k> = 28.507
Expected number of clusters, <c> = 6.65
FWEp: 4.662, FDRp: Inf, FWEc: 232, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.8 12.8 12.1 mm mm mm; 6.4 6.4 6.0 {voxels}
Volume: 1270464 = 158808 voxels = 592.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 247.20 voxels)

real_post1<pre





SPMresults: ./2ses3run_out−preventlose>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

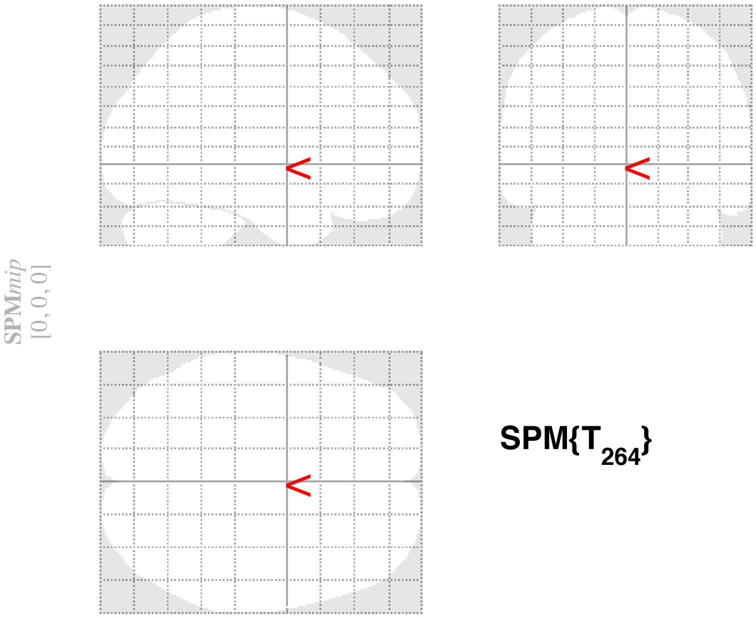
set−level		cluster−level				peak−level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.923	0.878	20	0.385	0.967	0.842	3.39	3.35	0.000	48 8 20
		0.946	0.878	16	0.439	0.967	0.842	3.39	3.35	0.000	−2 −2 56
		0.994	0.878	3	0.764	0.976	0.876	3.35	3.31	0.000	64 8 24
		0.994	0.878	3	0.764	0.981	0.876	3.33	3.29	0.001	−6 −52 −22
		0.996	0.878	2	0.814	0.985	0.876	3.31	3.27	0.001	22 −4 64
		0.997	0.878	1	0.878	0.985	0.876	3.30	3.27	0.001	−62 −10 38
		0.989	0.878	5	0.685	0.987	0.876	3.30	3.26	0.001	−44 38 8
		0.956	0.878	14	0.471	0.987	0.876	3.30	3.26	0.001	−56 16 34
						0.995	0.913	3.22	3.18	0.001	−52 8 34
		0.989	0.878	5	0.685	0.993	0.913	3.24	3.21	0.001	−62 −6 36
		0.994	0.878	3	0.764	0.994	0.913	3.22	3.19	0.001	−52 −2 30
		0.994	0.878	3	0.764	0.995	0.913	3.22	3.18	0.001	−26 −4 64
		0.997	0.878	1	0.878	0.995	0.913	3.22	3.18	0.001	30 −62 −14
		0.996	0.878	2	0.814	0.995	0.913	3.22	3.18	0.001	26 −4 42
		0.997	0.878	1	0.878	0.996	0.917	3.20	3.17	0.001	30 −4 38
		0.996	0.878	2	0.814	0.996	0.917	3.20	3.16	0.001	−30 −74 38
		0.997	0.878	1	0.878	0.997	0.917	3.19	3.15	0.001	−62 2 34
		0.994	0.878	3	0.764	0.997	0.917	3.18	3.15	0.001	−34 −62 32
		0.996	0.878	2	0.814	0.997	0.917	3.18	3.15	0.001	−58 −32 40
		0.997	0.878	1	0.878	0.998	0.934	3.16	3.13	0.001	6 −28 −24
		0.997	0.878	1	0.878	0.998	0.949	3.15	3.12	0.001	32 30 16
		0.997	0.878	1	0.878	0.999	0.978	3.13	3.10	0.001	−62 4 8

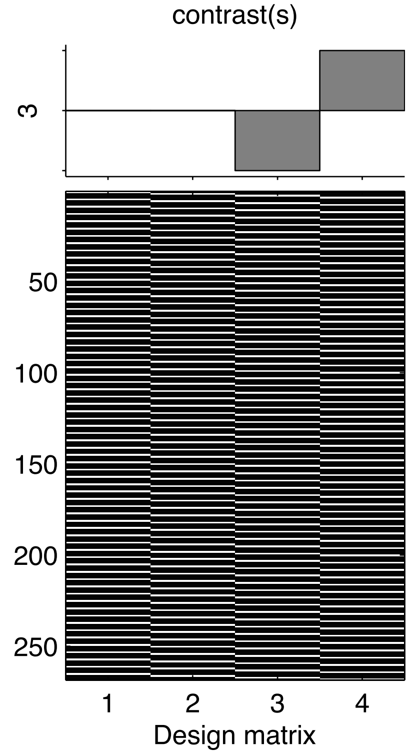
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.999)
Extent threshold: k = 0 voxels, p = 1.000 (0.999)
Expected voxels per cluster, <k> = 28.507
Expected number of clusters, <c> = 6.65
FWEp: 4.662, FDRp: Inf, FWEc: 232, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.8 12.8 12.1 mm mm mm; 6.4 6.4 6.0 {voxels}
Volume: 1270464 = 158808 voxels = 592.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 247.20 voxels)

real_post1>pre



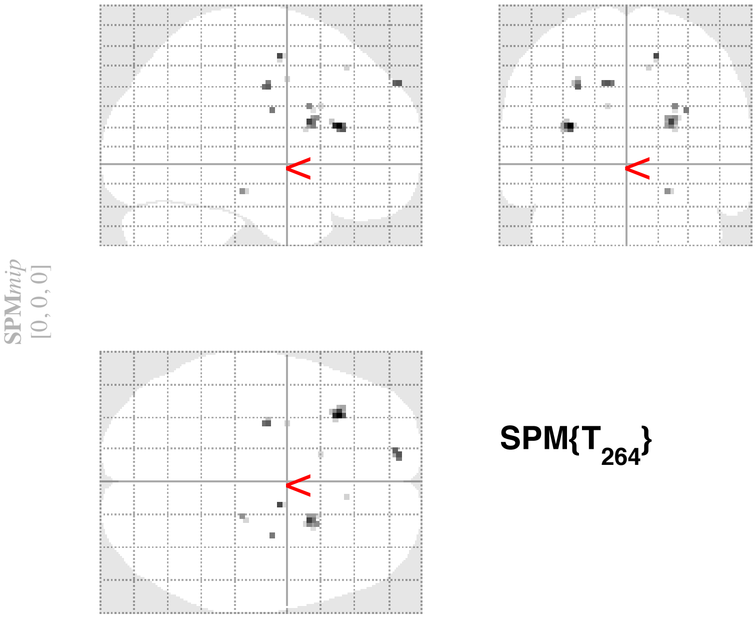


SPMresults: ./2ses3run_out−preventlose>0_s

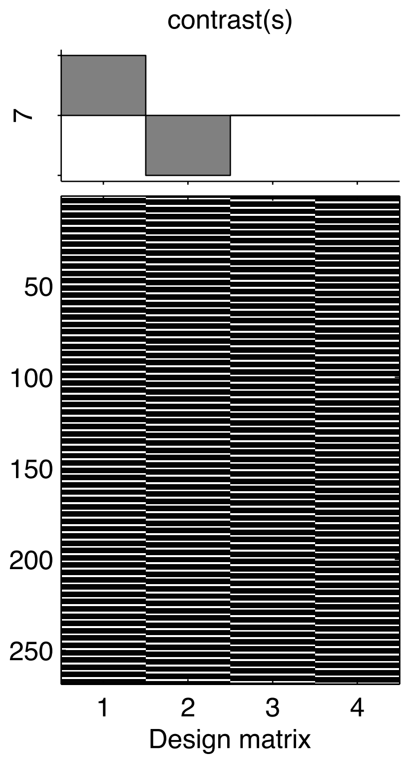
Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

sham_post1<pre



$SPM\{T_{264}\}$



SPMresults: ./2ses3run_out−preventlose>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

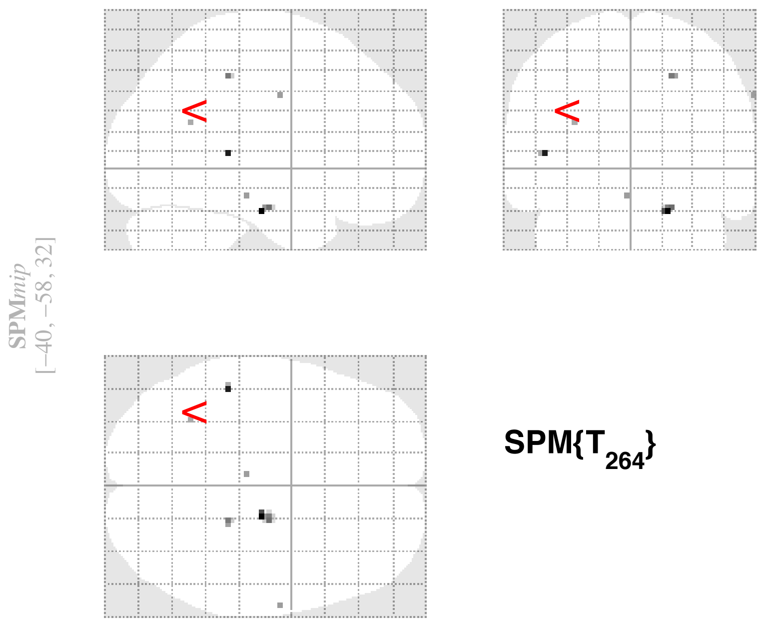
set−level		cluster−level				peak−level					
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	mm mm mm
0.076	11	0.956	0.878	14	0.471	0.852	0.895	3.60	3.55	0.000	−32 26 18
		0.951	0.878	15	0.455	0.944	0.895	3.45	3.41	0.000	22 10 20
		0.994	0.878	3	0.764	0.951	0.895	3.43	3.39	0.000	14 −6 54
		0.992	0.878	4	0.721	0.961	0.895	3.41	3.37	0.000	−12 58 40
		0.992	0.878	4	0.721	0.965	0.895	3.39	3.35	0.000	−28 −12 38
		0.997	0.878	1	0.878	0.980	0.895	3.33	3.30	0.000	30 −10 26
		0.996	0.878	2	0.814	0.984	0.895	3.31	3.27	0.001	24 10 28
		0.996	0.878	2	0.814	0.989	0.895	3.28	3.25	0.001	20 −26 −16
		0.997	0.878	1	0.878	0.998	0.950	3.15	3.12	0.001	−28 −2 42
		0.997	0.878	1	0.878	0.998	0.950	3.15	3.12	0.001	10 30 48
		0.997	0.878	1	0.878	0.998	0.950	3.14	3.11	0.001	−12 16 28

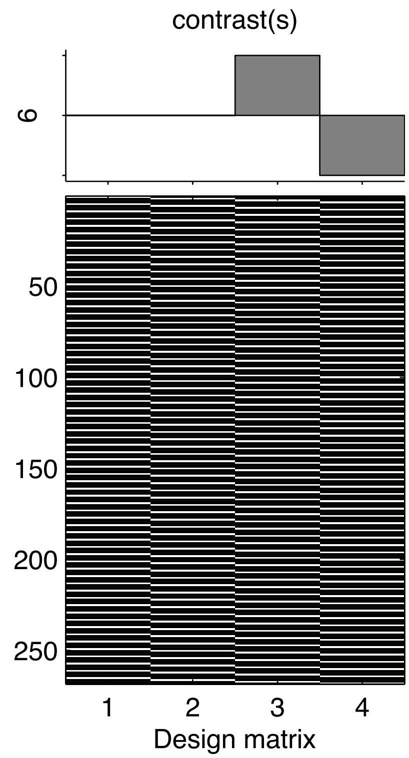
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.999)
Extent threshold: k = 0 voxels, p = 1.000 (0.999)
Expected voxels per cluster, <k> = 28.507
Expected number of clusters, <c> = 6.65
FWEp: 4.662, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.8 12.8 12.1 mm mm mm; 6.4 6.4 6.0 {voxels}
Volume: 1270464 = 158808 voxels = 592.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 247.20 voxels)

real_post1<pre





SPMresults: ./2ses2run_out+nowin>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

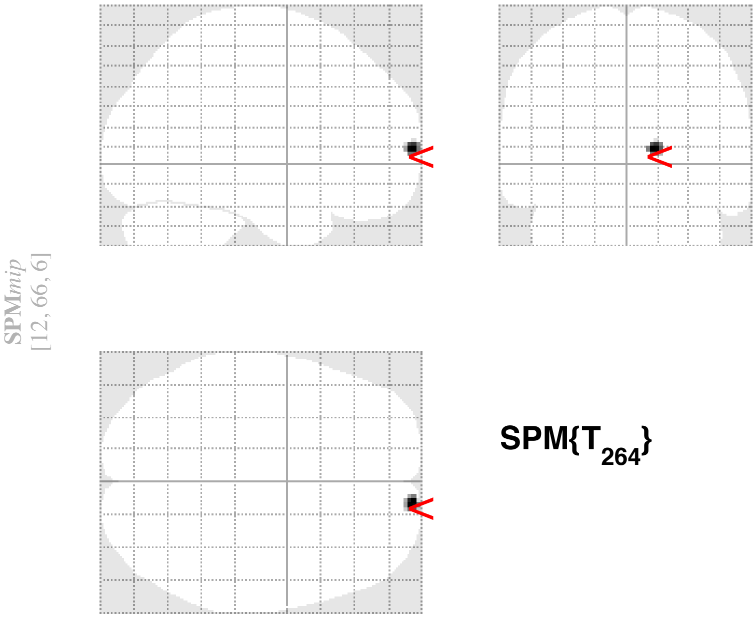
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.515	6	0.969	0.890	9	0.604	0.927	0.813	3.43	3.39	0.000	18 −18 −24
		0.992	0.890	2	0.831	0.947	0.813	3.39	3.35	0.000	−48 −36 6
		0.989	0.890	3	0.784	0.982	0.813	3.27	3.23	0.001	20 −36 46
		0.994	0.890	1	0.890	0.989	0.813	3.22	3.19	0.001	64 −8 36
		0.994	0.890	1	0.890	0.989	0.813	3.22	3.19	0.001	−4 −26 −16
		0.994	0.890	1	0.890	0.991	0.813	3.21	3.17	0.001	−32 −56 22

table shows 3 local maxima more than 8.0mm apart

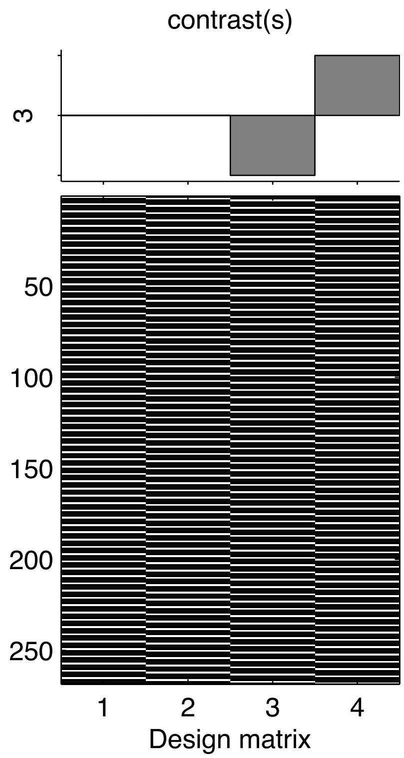
Height threshold: T = 3.12, p = 0.001 (0.997)
Extent threshold: k = 0 voxels, p = 1.000 (0.997)
Expected voxels per cluster, <k> = 33.352
Expected number of clusters, <c> = 5.76
FWEp: 4.624, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.4 13.5 12.8 mm mm mm; 6.7 6.7 6.4 {voxels}
Volume: 1270464 = 158808 voxels = 506.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 289.21 voxels)

real_post1>pre



SPM{T_{264}}



SPMresults: ./2ses2run_out+nowin>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p−values adjusted for search volume***

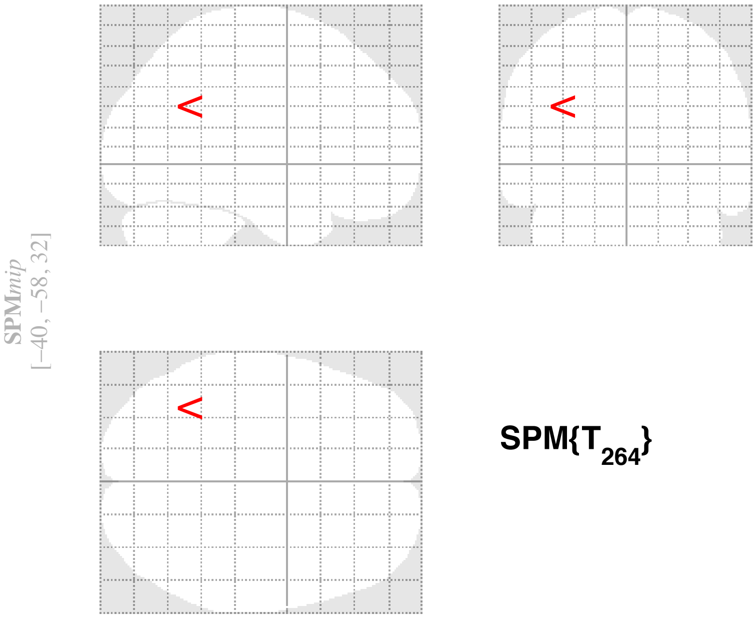
set−level		cluster−level				peak−level					mm mm mm
p	*c*					$p_{FWE-corr}$	$q_{FDR-corr}$	*T*	($Z_{\equiv}$)	p_{uncorr}	
		0.845	0.324	30	0.324	0.465	0.108	3.92	3.86	0.000	12 66 6

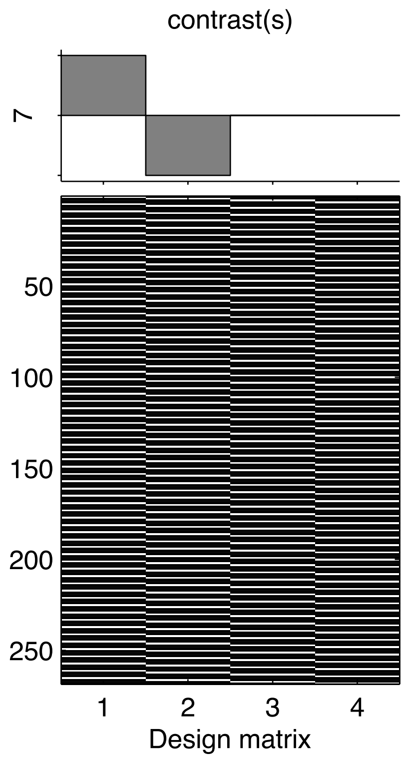
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.997)
Extent threshold: k = 0 voxels, p = 1.000 (0.997)
Expected voxels per cluster, <k> = 33.352
Expected number of clusters, <c> = 5.76
FWEp: 4.624, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.4 13.5 12.8 mm mm mm; 6.7 6.7 6.4 {voxels}
Volume: 1270464 = 158808 voxels = 506.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 289.21 voxels)

sham_post1<pre





SPMresults: ./2ses2run_out+nowin>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

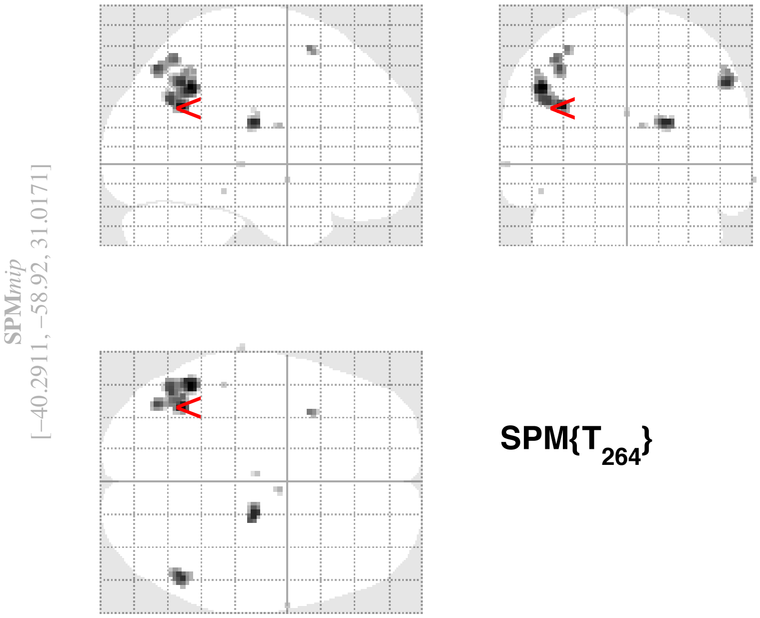
no suprathreshold clusters

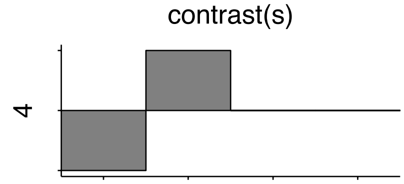
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.997)
Extent threshold: k = 0 voxels, p = 1.000 (0.997)
Expected voxels per cluster, <k> = 33.352
Expected number of clusters, <c> = 5.76
FWEp: 4.624, FDRp: Inf, FWEc: Inf, FDRc: Inf

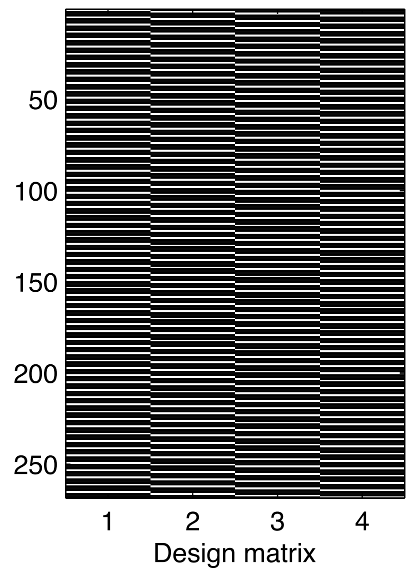
Degrees of freedom = [1.0, 264.0]
FWHM = 13.4 13.5 12.8 mm mm mm; 6.7 6.7 6.4 {voxels}
Volume: 1270464 = 158808 voxels = 506.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 289.21 voxels)

sham_post1>pre





SPM{T_{264}}



SPMresults: ./2ses2run_out+nowin>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p*–values adjusted for search volume**

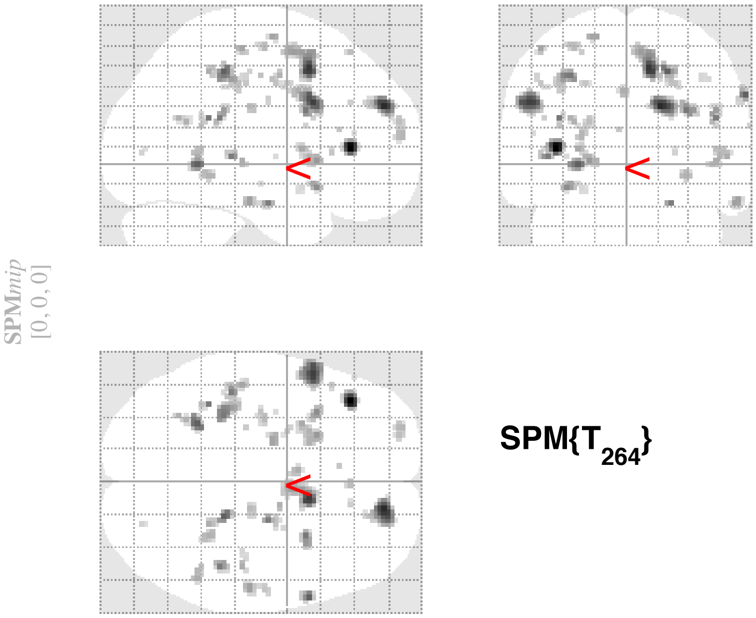
set–level		cluster–level				peak–level					mm mm mm		
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}			
0.068	**10**	**0.129**	**0.239**	**181**	**0.024**	**0.635**	**0.832**	**3.76**	**3.71**	**0.000**	**−48**	**−54**	**38**
						0.697	0.832	3.71	3.66	0.000	−36	−58	28
						0.848	0.832	3.55	3.51	0.000	−44	−64	30
		0.809	**0.717**	**35**	**0.287**	**0.769**	**0.832**	**3.64**	**3.59**	**0.000**	**18**	**−20**	**20**
		0.611	**0.717**	**61**	**0.164**	**0.791**	**0.832**	**3.61**	**3.57**	**0.000**	**52**	**−58**	**40**
		0.724	**0.717**	**46**	**0.224**	**0.860**	**0.832**	**3.53**	**3.49**	**0.000**	**−38**	**−72**	**48**
						0.909	0.832	3.46	3.42	0.000	−40	−62	52
		0.980	**0.890**	**6**	**0.680**	**0.937**	**0.851**	**3.41**	**3.37**	**0.000**	**−34**	**10**	**58**
		0.989	**0.890**	**3**	**0.784**	**0.985**	**0.893**	**3.25**	**3.22**	**0.001**	**6**	**−6**	**18**
		0.992	**0.890**	**2**	**0.831**	**0.991**	**0.893**	**3.20**	**3.17**	**0.001**	**−2**	**−18**	**24**
		0.994	**0.890**	**1**	**0.890**	**0.992**	**0.893**	**3.19**	**3.16**	**0.001**	**66**	**−2**	**−10**
		0.994	**0.890**	**1**	**0.890**	**0.993**	**0.893**	**3.19**	**3.15**	**0.001**	**−48**	**−36**	**−16**
		0.989	**0.890**	**3**	**0.784**	**0.994**	**0.893**	**3.17**	**3.14**	**0.001**	**−66**	**−26**	**−2**

table shows 3 local maxima more than 8.0mm apart

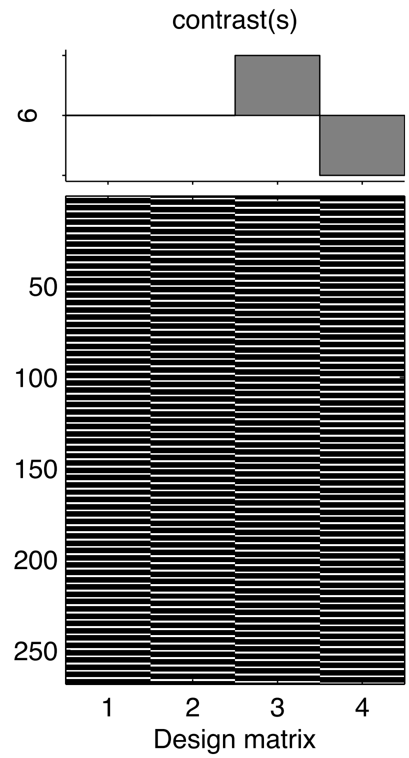
Height threshold: T = 3.12, p = 0.001 (0.997)
Extent threshold: k = 0 voxels, p = 1.000 (0.997)
Expected voxels per cluster, <k> = 33.352
Expected number of clusters, <c> = 5.76
FWEp: 4.624, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.4 13.5 12.8 mm mm mm; 6.7 6.7 6.4 {voxels}
Volume: 1270464 = 158808 voxels = 506.5 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 289.21 voxels)

real_post1<pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_out+win>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p–values adjusted for search volume*

set–level		cluster–level				peak–level					mm mm mm		
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}			
0.000	48	0.728	0.882	45	0.203	0.175	0.949	4.30	4.22	0.000	-40	32	6
		0.270	0.799	117	0.049	0.366	0.949	4.05	3.98	0.000	16	50	28
		0.199	0.799	138	0.035	0.446	0.949	3.97	3.90	0.000	10	10	48
						0.934	0.949	3.46	3.42	0.000	6	2	56
		0.274	0.799	116	0.050	0.478	0.949	3.94	3.88	0.000	-54	12	30
		0.949	0.882	15	0.465	0.661	0.949	3.77	3.72	0.000	62	10	34
		0.880	0.882	26	0.331	0.668	0.949	3.77	3.71	0.000	-28	-50	-2
		0.865	0.882	28	0.313	0.671	0.949	3.77	3.71	0.000	20	-36	46
						0.964	0.949	3.38	3.34	0.000	24	-44	46
		0.985	0.882	6	0.660	0.794	0.949	3.65	3.60	0.000	-38	-44	22
		0.880	0.882	26	0.331	0.799	0.949	3.64	3.59	0.000	30	8	26
		0.629	0.882	57	0.155	0.801	0.949	3.64	3.59	0.000	-32	-36	44
						0.985	0.949	3.29	3.26	0.001	-38	-28	40
		0.991	0.882	4	0.728	0.818	0.949	3.62	3.57	0.000	22	-12	-22
		0.959	0.882	13	0.498	0.821	0.949	3.62	3.57	0.000	-44	-32	2
		0.920	0.882	20	0.395	0.822	0.949	3.62	3.57	0.000	46	-38	22
		0.949	0.882	15	0.465	0.887	0.949	3.54	3.49	0.000	-34	14	-14
		0.753	0.882	42	0.218	0.927	0.949	3.47	3.43	0.000	-22	14	0
						0.957	0.949	3.40	3.36	0.000	-28	6	6
		0.908	0.882	22	0.372	0.942	0.949	3.44	3.40	0.000	56	-22	-22
						0.989	0.949	3.26	3.23	0.001	58	-14	-22
		0.982	0.882	7	0.631	0.947	0.949	3.43	3.39	0.000	-48	-26	58

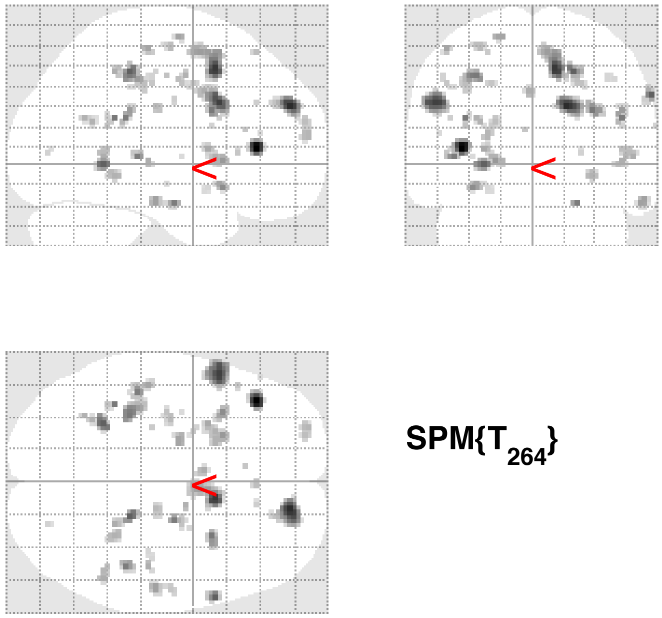
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.720
Expected number of clusters, <c> = 6.41
FWEp: 4.652, FDRp: Inf, FWEc: Inf, FDRc: Inf

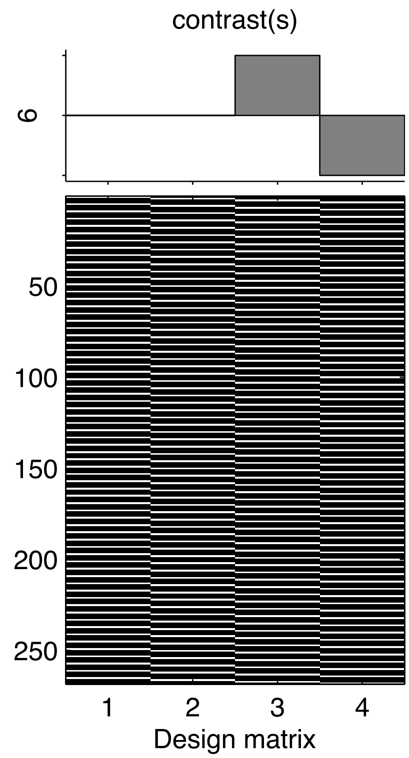
Degrees of freedom = [1.0, 264.0]
FWHM = 12.9 12.9 12.4 mm mm mm; 6.4 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 568.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 257.72 voxels)

real_post1<pre

SPM*mip* [0, 0, 0]



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_out+win>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p*–values adjusted for search volume**

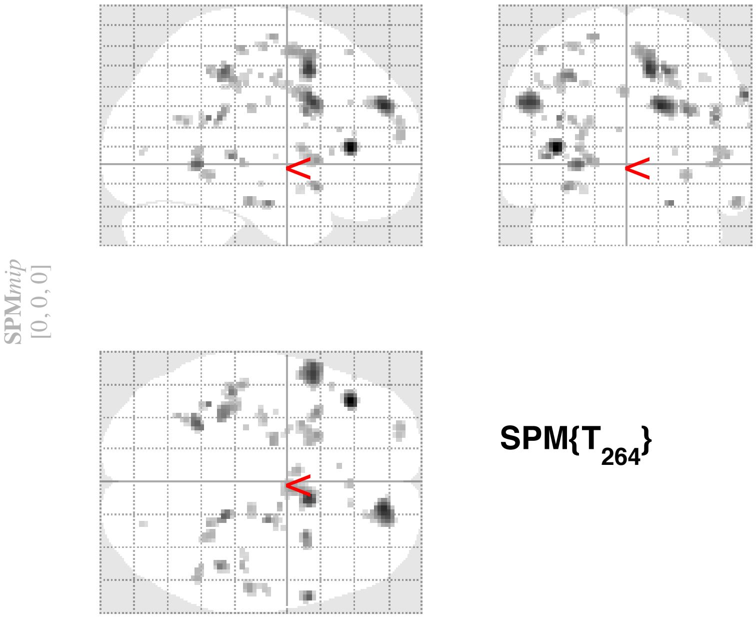
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_\equiv)$	p_{uncorr}	
		0.979	0.882	8	0.604	0.951	0.949	3.42	3.38	0.000	-20 -10 64
		0.972	0.882	10	0.557	0.965	0.949	3.38	3.34	0.000	-4 4 36
		0.988	0.882	5	0.692	0.965	0.949	3.38	3.34	0.000	46 -26 0
		0.949	0.882	15	0.465	0.966	0.949	3.37	3.34	0.000	52 -50 2
		0.949	0.882	15	0.465	0.970	0.949	3.36	3.32	0.000	30 -44 -8
		0.993	0.882	3	0.769	0.972	0.949	3.36	3.32	0.000	14 -6 44
		0.972	0.882	10	0.557	0.972	0.949	3.35	3.32	0.000	-30 -56 20
		0.873	0.882	27	0.322	0.978	0.949	3.33	3.29	0.000	-26 60 12
						0.985	0.949	3.29	3.25	0.001	-22 58 20
		0.968	0.882	11	0.536	0.981	0.949	3.32	3.28	0.001	-30 -14 58
		0.968	0.882	11	0.536	0.981	0.949	3.31	3.28	0.001	16 -22 28
		0.979	0.882	8	0.604	0.984	0.949	3.30	3.26	0.001	22 -10 42
		0.993	0.882	3	0.769	0.985	0.949	3.29	3.25	0.001	4 32 56
		0.995	0.882	2	0.819	0.987	0.949	3.28	3.25	0.001	-34 -16 44
		0.996	0.882	1	0.882	0.991	0.949	3.25	3.21	0.001	-6 26 16
		0.993	0.882	3	0.769	0.991	0.949	3.25	3.21	0.001	-48 -24 40
		0.995	0.882	2	0.819	0.991	0.949	3.25	3.21	0.001	-48 22 4
		0.993	0.882	3	0.769	0.991	0.949	3.25	3.21	0.001	-24 -2 40
		0.996	0.882	1	0.882	0.992	0.949	3.24	3.20	0.001	-26 -24 56
		0.993	0.882	3	0.769	0.994	0.949	3.22	3.18	0.001	58 -12 32
		0.995	0.882	2	0.819	0.994	0.949	3.21	3.18	0.001	14 32 30
		0.996	0.882	1	0.882	0.995	0.949	3.20	3.17	0.001	-46 12 22

table shows 3 local maxima more than 8.0mm apart

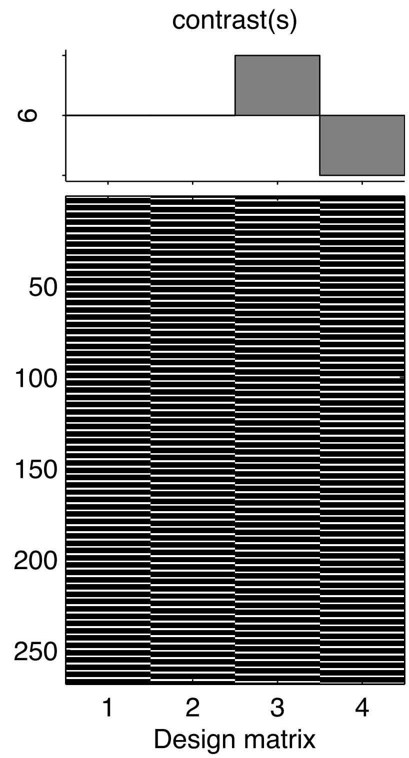
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.720
Expected number of clusters, <c> = 6.41
FWEp: 4.652, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.9 12.9 12.4 mm mm mm; 6.4 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 568.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 257.72 voxels)

real_post1<pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_out+win>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p-values adjusted for search volume*

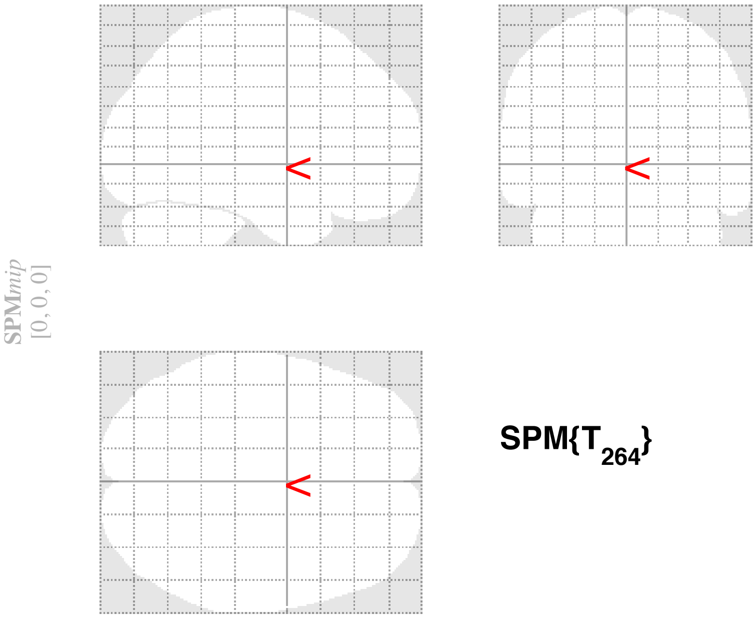
set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
		0.996	0.882	1	0.882	0.995	0.949	3.20	3.16	0.001	20 −22 46
		0.996	0.882	1	0.882	0.995	0.949	3.19	3.16	0.001	64 8 18
		0.995	0.882	2	0.819	0.996	0.949	3.19	3.16	0.001	24 −80 4
		0.988	0.882	5	0.692	0.996	0.949	3.18	3.15	0.001	−26 6 −14
		0.988	0.882	5	0.692	0.996	0.949	3.18	3.15	0.001	42 −24 42
		0.996	0.882	1	0.882	0.997	0.949	3.17	3.14	0.001	26 −4 38
		0.995	0.882	2	0.819	0.997	0.951	3.16	3.12	0.001	−46 −34 38
		0.996	0.882	1	0.882	0.998	0.951	3.15	3.12	0.001	−34 −8 2
		0.996	0.882	1	0.882	0.998	0.951	3.15	3.12	0.001	−28 −16 −12
		0.996	0.882	1	0.882	0.998	0.951	3.14	3.11	0.001	−52 34 14

table shows 3 local maxima more than 8.0mm apart

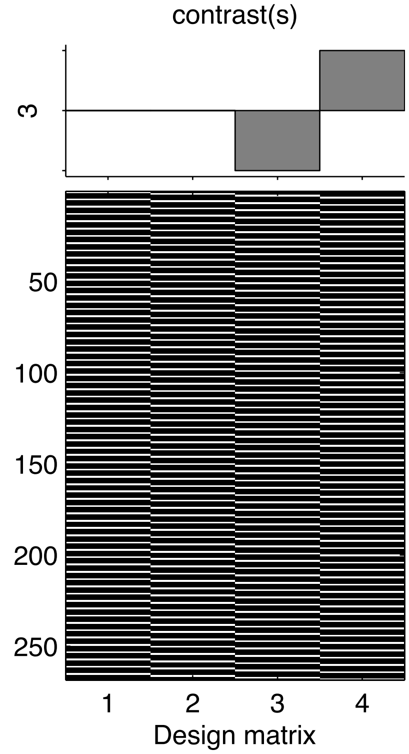
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.720
Expected number of clusters, <c> = 6.41
FWEp: 4.652, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.9 12.9 12.4 mm mm mm; 6.4 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 568.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 257.72 voxels)

real_post1>pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_out+win>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

no suprathreshold clusters

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
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FWEp: 4.652, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.9 12.9 12.4 mm mm mm; 6.4 6.5 6.2 {voxels}
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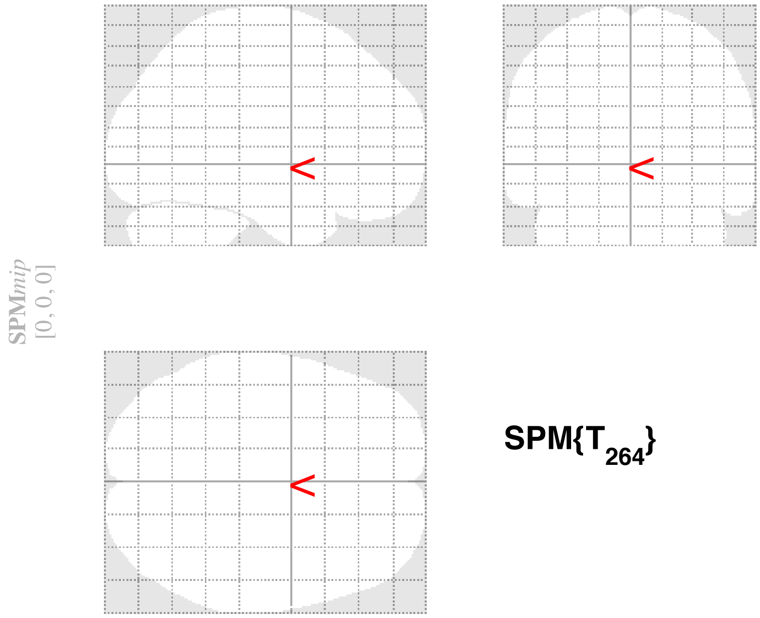
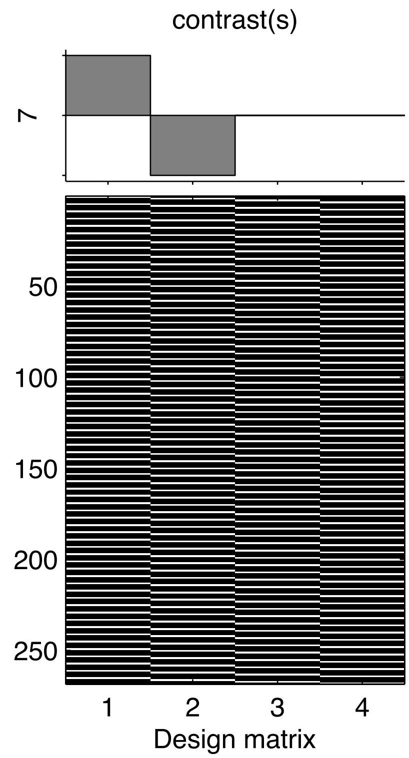
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 257.72 voxels)

sham_post1<pre





SPMresults: ./sl2014/2ses2run_out+win>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

no suprathreshold clusters

table shows 3 local maxima more than 8.0mm apart

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Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.720
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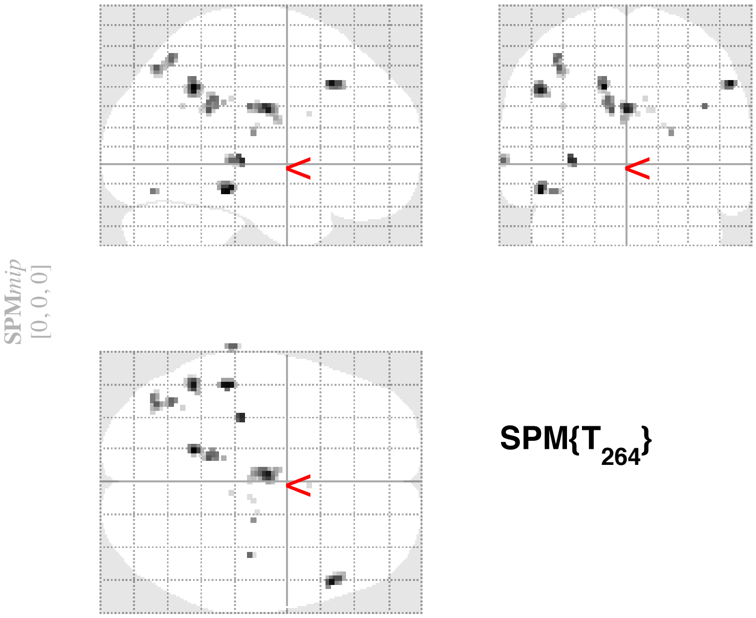
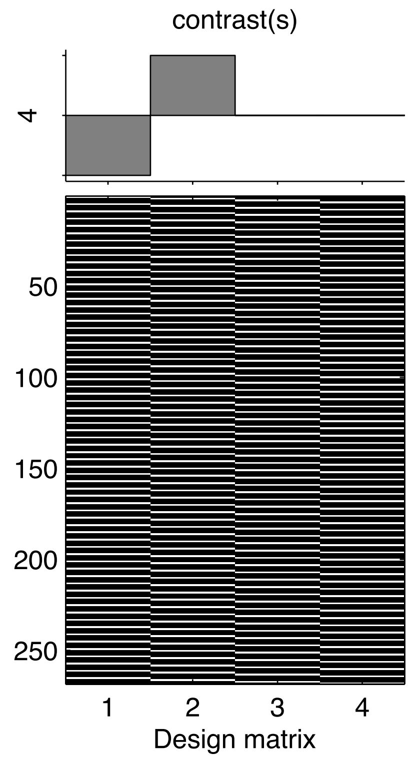
FWEp: 4.652, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.9 12.9 12.4 mm mm mm; 6.4 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 568.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 257.72 voxels)

sham_post1>pre



SPM{T_{264}}



SPMresults: ./sl2014/2ses2run_out+win>0_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p–values adjusted for search volume*

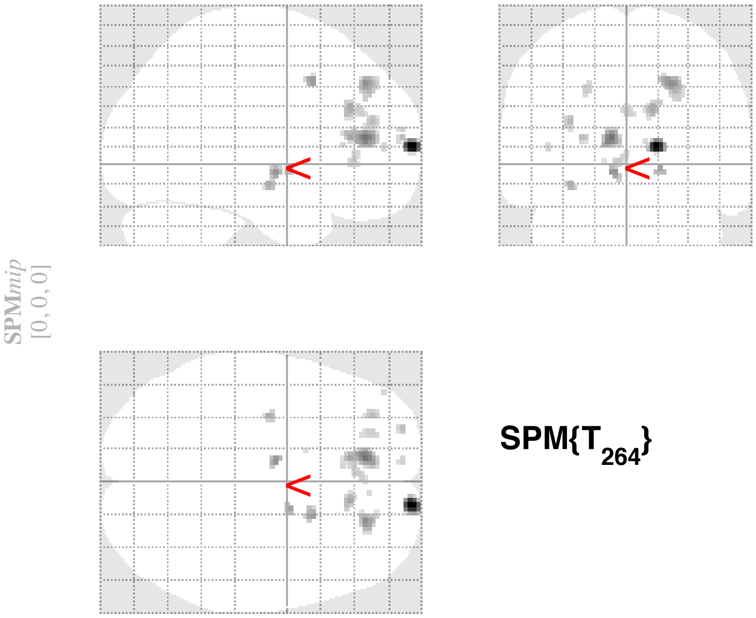
set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.000	18	0.938	0.882	17	0.435	0.713	0.835	3.73	3.68	0.000	-14 -52 38
		0.927	0.882	19	0.408	0.753	0.835	3.69	3.64	0.000	-48 -34 -16
		0.933	0.882	18	0.421	0.771	0.835	3.67	3.62	0.000	54 22 40
		0.802	0.882	36	0.253	0.783	0.835	3.66	3.61	0.000	-48 -52 36
		0.694	0.882	49	0.185	0.795	0.835	3.65	3.60	0.000	-2 -12 26
		0.985	0.882	6	0.660	0.831	0.835	3.61	3.56	0.000	-32 -26 0
		0.887	0.882	25	0.341	0.915	0.835	3.49	3.45	0.000	-10 -44 26
		0.887	0.882	25	0.341	0.930	0.835	3.47	3.42	0.000	-38 -72 48
						0.938	0.835	3.45	3.41	0.000	-40 -64 52
		0.972	0.882	10	0.557	0.941	0.835	3.44	3.40	0.000	-68 -32 0
		0.995	0.882	2	0.819	0.946	0.835	3.43	3.39	0.000	40 -22 28
		0.985	0.882	6	0.660	0.959	0.845	3.40	3.36	0.000	-42 -74 -16
		0.995	0.882	2	0.819	0.977	0.930	3.33	3.29	0.000	22 -20 14
		0.996	0.882	1	0.882	0.990	0.968	3.26	3.22	0.001	-10 -36 30
		0.996	0.882	1	0.882	0.997	1.000	3.16	3.13	0.001	-36 -58 28
		0.996	0.882	1	0.882	0.997	1.000	3.15	3.12	0.001	8 -32 32
		0.996	0.882	1	0.882	0.998	1.000	3.14	3.10	0.001	4 10 24
		0.995	0.882	2	0.819	0.998	1.000	3.13	3.10	0.001	12 -20 26
		0.996	0.882	1	0.882	0.998	1.000	3.12	3.09	0.001	18 -18 18

table shows 3 local maxima more than 8.0mm apart

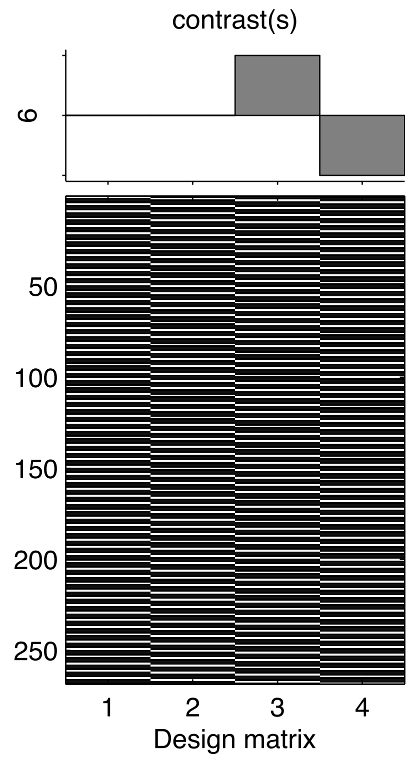
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 29.720
Expected number of clusters, <c> = 6.41
FWEp: 4.652, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 12.9 12.9 12.4 mm mm mm; 6.4 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 568.3 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 257.72 voxels)

real_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_out+win>out+nowin_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

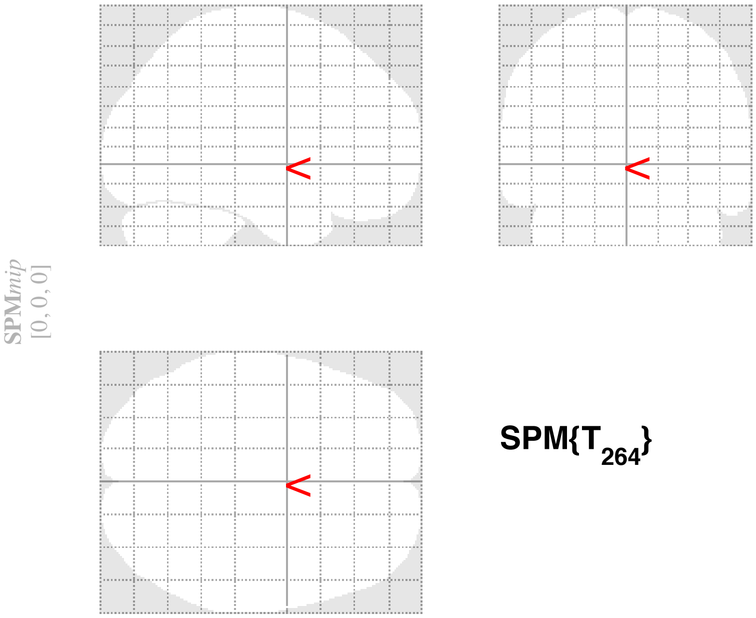
set-level		cluster-level				peak-level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	
0.000	18	0.729	0.884	45	0.211	0.111	0.419	4.42	4.34	0.000	14 64 8
		0.396	0.884	92	0.081	0.694	0.967	3.73	3.68	0.000	-10 40 12
		0.609	0.884	60	0.152	0.863	0.967	3.56	3.51	0.000	22 40 40
						0.993	0.967	3.22	3.18	0.001	26 40 32
		0.957	0.884	13	0.506	0.872	0.967	3.55	3.50	0.000	-8 -8 -6
		0.957	0.884	13	0.506	0.902	0.967	3.50	3.46	0.000	20 12 42
		0.981	0.884	7	0.637	0.932	0.967	3.45	3.41	0.000	16 0 -4
		0.912	0.884	21	0.392	0.946	0.967	3.42	3.38	0.000	12 32 28
		0.977	0.884	8	0.611	0.948	0.967	3.41	3.37	0.000	-32 -12 -12
		0.930	0.884	18	0.429	0.972	0.967	3.34	3.30	0.000	-32 44 20
		0.987	0.884	5	0.698	0.980	0.967	3.31	3.27	0.001	-26 60 12
		0.970	0.884	10	0.565	0.989	0.967	3.26	3.22	0.001	-2 36 26
		0.957	0.884	13	0.506	0.989	0.967	3.25	3.22	0.001	-6 34 0
		0.961	0.884	12	0.524	0.992	0.967	3.23	3.19	0.001	-24 44 36
		0.992	0.884	3	0.774	0.994	0.967	3.20	3.17	0.001	-8 60 16
		0.996	0.884	1	0.884	0.995	0.967	3.19	3.15	0.001	-6 28 8
		0.994	0.884	2	0.822	0.996	0.967	3.17	3.14	0.001	-44 50 6
		0.996	0.884	1	0.884	0.997	0.967	3.15	3.12	0.001	8 42 10
		0.996	0.884	1	0.884	0.998	0.967	3.14	3.10	0.001	-14 8 0

table shows 3 local maxima more than 8.0mm apart

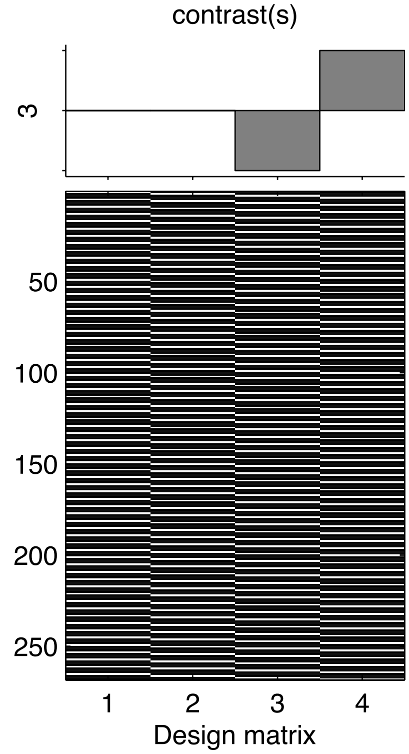
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.769
Expected number of clusters, <c> = 6.20
FWEp: 4.643, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.2 13.0 12.4 mm mm mm; 6.6 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.0 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.81 voxels)

real_post1>pre



SPM{T_{264}}



SPMresults: ./2ses2run_out+win>out+nowin_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

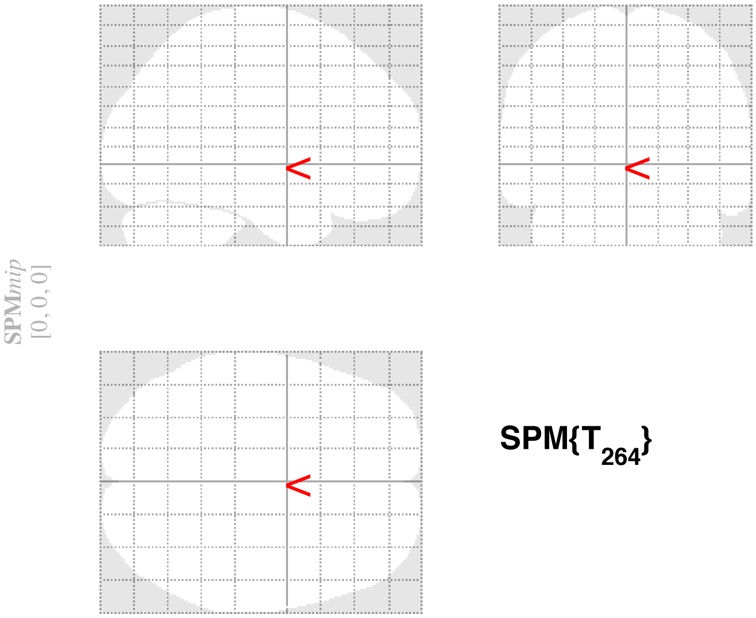
no suprathreshold clusters

table shows 3 local maxima more than 8.0mm apart

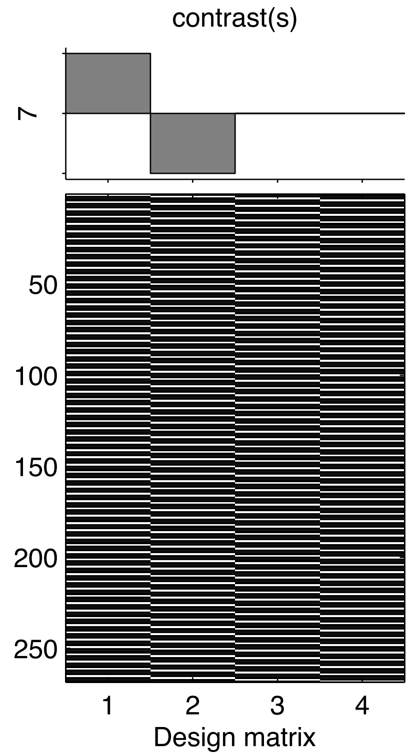
Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.769
Expected number of clusters, <c> = 6.20
FWEp: 4.643, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.2 13.0 12.4 mm mm mm; 6.6 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.0 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.81 voxels)

sham_post1<pre



SPM{T_{264}}



SPMresults: ./2ses2run_out+win>out+nowin_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: ***p–values adjusted for search volume***

set–level		cluster–level				peak–level					mm mm mm
p	c	$p_{FWE-corr}$	$q_{FDR-corr}$	k_E	p_{uncorr}	$p_{FWE-corr}$	$q_{FDR-corr}$	T	$(Z_{\equiv})$	p_{uncorr}	

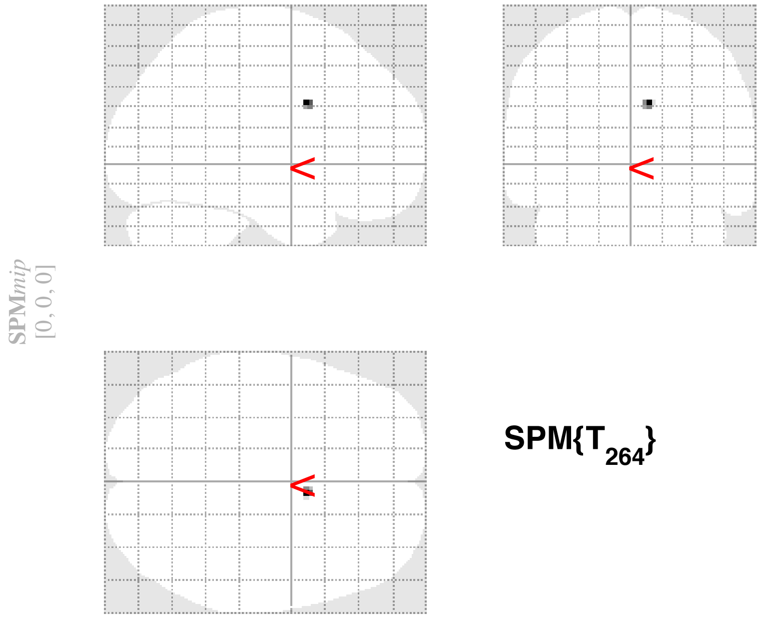
no suprathreshold clusters

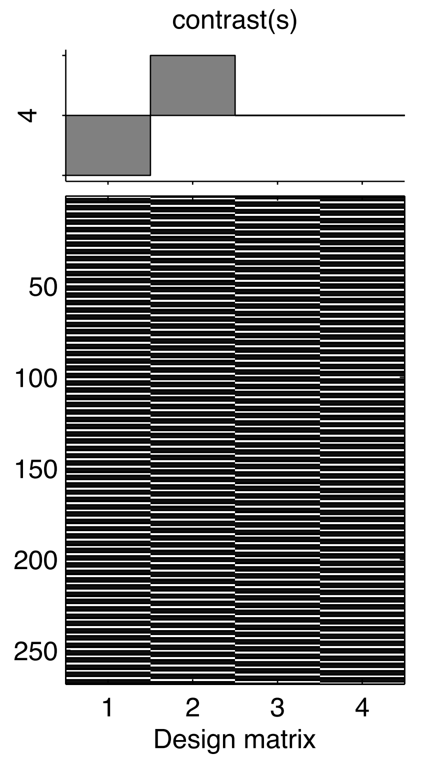
table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.769
Expected number of clusters, <c> = 6.20
FWEp: 4.643, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.2 13.0 12.4 mm mm mm; 6.6 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.0 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.81 voxels)

sham_post1>pre





SPMresults: ./2ses2run_out+win>out+nowin_s

Height threshold T = 3.121388 {p<0.001 (unc.)}

Extent threshold k = 0 voxels

Statistics: *p–values adjusted for search volume*

set–level		cluster–level				peak–level					mm mm mm
p	*c*					$p_{FWE-corr}$	$q_{FDR-corr}$	*T*	($Z_{\equiv}$)	p_{uncorr}	
		0.977	0.611	8	0.611	0.911	0.390	3.49	3.44	0.000	8 6 30

table shows 3 local maxima more than 8.0mm apart

Height threshold: T = 3.12, p = 0.001 (0.998)
Extent threshold: k = 0 voxels, p = 1.000 (0.998)
Expected voxels per cluster, <k> = 30.769
Expected number of clusters, <c> = 6.20
FWEp: 4.643, FDRp: Inf, FWEc: Inf, FDRc: Inf

Degrees of freedom = [1.0, 264.0]
FWHM = 13.2 13.0 12.4 mm mm mm; 6.6 6.5 6.2 {voxels}
Volume: 1270464 = 158808 voxels = 549.0 resels
Voxel size: 2.0 2.0 2.0 mm mm mm; (resel = 266.81 voxels)

9. Curriculum Vitae

Ausbildung

15.10.2010:	***Vordiplom Psychologie***: ***Universität Wien***
seit Oktober 2008:	***Diplomstudium Psychologie***, Universität Wien Außerordentlicher Student, Medizinische Universität Wien
März 2005 – Juni 2005:	***Bakkalaureat-Studium Software and Information Engineering Technische Universität Wien***
Juni 2004	***Matura***
September 1999 – Juni 2004:	***Bundesoberstufenrealgymnasium Honauerstraße, Linz*** *Schwerpunkt: Informatik*
September 1996 – Juni 1999:	***Körnerschule (Unterstufengymnasium)***, Linz *neusprachlicher Schwerpunkt*

Weitere Qualifikationen

Fremdsprachen	**Englisch** (fließend), **Latein**
01.07.2000	Ausbildung zum **Sanitätshelfer**, Österreichisches Rotes Kreuz
EDV Kentnisse	Anwendung, Systemadministration, Netzwerk: MacOS, Linux, Windows Office-Anwendungen, Webdesign (HTML, php), diverser CMS, Mediawiki, Google Apps, etc. Matlab, SPM, Programmierung in Pascal, Delphi
Vertiefende Lehre	Vorlesungen zu **Neurowissenschaft**, **Kognitionswissenschaft**, **funktionelle Magnetresonanztomographie** (Windischberger)

Konferenzen

14. – 21.03.2014	**„Cognition 3.0 - the social mind in the connected world“** Interdisciplinary College (Günne, Deutschland)
02. – 14.09.2013	**„Resting state fMRI - basic concepts, methods & applications“** The European Society for Magnetic Resonance in Medicine and Biology (ESMRMB, Wien)
15. – 22.03.2013	**„Wicked Problems, Complexity & Wisdom“** Interdisciplinary College (Günne, Deutschland)

Beruflicher Werdegang

seit Mai 2014	**Zentrum für Medizinische Physik und Biomedizinische Technik, Medizinische Universität Wien**, 1090 Wien Projektmitarbeit „Creativity enhancement through advanced brain mapping and stimulation“ (CREAM; FP7, ICT-2013.8.1, 612022)
03/2011 - laufend	**Sensor Marktforschung Ges.m.b.H.,** 1060 Wien
10/2007 – 10/2008	**Ergonis Software, Günter Blaschek,** 4020 Linz technischer Support
03/2007 –08/2008:	**Teilzeitbeschäftigung: Integral Marktforschung**, 1030 Wien
09/2005 –03/2008:	**Selbstständig im Bereich Werbung und Marktkommunikation, „Advocado direct sales & market communication agentur“** Directsales: Wiener Frühstücksservice, Kinder Charity, Day Dreams Marktforschung: Triconsult, Sensor, div. Kleinunternehmer_innen
01/2005 –08/2005:	**Promotion-Kampagnenleitung: *x-pr Agentur*** *Leitner, Thür OEG, 1030 Wien*
08/2007 –09/2007:	**Praktikum: *Smart Stream Technologies*,** Helpdesk, technischer Support

Weitere Tätigkeiten

09/2004 – 12/2004	**Grundwehrdienst, Aufklärungskompanie,** 4600 Wels
01/2000 – 12/2000	**Ehrenamtliche Mitarbeit, Rotes Kreuz,** 4210 Gallneukirchen Rettungssanitäter