

Modulation of moral judgements through priming of religious
concepts and out-group discrimination – an fMRI study

Brain Imaging – Research Proposal

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1 Introduction

While (fundamentalist) religious belief has decreased significantly in Europe, billions of people on this globe still actively engage in religious practice, and believe that their sense of morality is granted to them by a supernatural being, God. Although moral judgements and morality is an incredibly hard thing to pin down, and consists of many different elements as shown by Borg et al., (2006), many still claim that Atheists (A), cannot possibly be moral, as they do not believe in a supernatural creator who provides these moral guidelines. Although studies have readily explained that such a thing most likely does not exist (Boyer, 2003), there is great lack of functional magnetic resonance imaging (fMRI) studies that investigate the differences between religious and non-religious people through neuroscientific methodologies as fMRI. Although not many studies exist to date, it is logical to assume from the religious point of view, that religious and non-religious people employ different strategies when faced with (moral) dilemma's, as they are both brought up with different concepts about what is right and what is wrong. These concepts about what is right and wrong are in religious people often enforced, or modulated, by the belief in an afterlife in the form of heaven and hell. Especially in Fundamentalist Protestantism (FP), there is a great emphasis on leading a virtuous life in the eyes of God in order to get into heaven, or leading a non-virtuous life and going straight to hell (Exline, 2003) . Priming the concepts of heaven and hell, might therefore modulate moral decision making, as both concepts emphasise different constructs, sin and punishment for Hell, whereas forgiveness and compassion are associated with Heaven. Furthermore, it is thought that moral judgement is highly influenced by in-and-out group factors. As Cikara et al., (2010) state : "Moral decisions are not made in a vacuum; intergroup biases and stereotypes weigh heavily on neural systems implicated in moral decision making". Although an immoral decision made by your friend might be immoral, it is easier to let this slip through your fingers than it would be to approve the same decision made by an individual from an outgroup. Singer & Singer, (1997) found the same conclusions in their study, where the relationship between the observer and the moral agent was of great importance for the moral judgement. For this reason, the scenario's constructed for this study will be presented in such a way as to present either a Fundamental Protestant or an Atheist. Finding

clear differences in brain regions involved with making the decisions between these groups, between the priming conditions Heaven and Hell and across both participant groups, we can state that religious constructs, are not just ethereal things, but out there in the world, and actively influencing the billions who are brought up with them in their day to day lives. These findings could be helpful in identifying the beneficial and hurtful ideas that reside within religious doctrine, as well as showing that many moral decisions are more selected towards protecting in-out-group values than representing actual divine intervention within moral judgement.

2 Methods

In order to investigate the questions formulated in the introduction, an event-related design is used. Two distinct groups with 2 conditions will be made, respectively Atheists and Fundamentalist Protestants and *Heaven* and *Hell*. To gather enough data and to protect against drop outs or bad scans, each group/condition combination will contain 10 participants. The priming manipulation at the start of each run will consist of a screen which asks the participants to either imagine and envision ‘Hell’ or ‘Heaven’. After the priming of these concepts (30 seconds), the participants must perform a series of judgement tasks. These tasks will be constructed specifically for this experiment, and consist of a wide variety of every day moral decision dilemma’s . In the scenario’s, these decisions are either made by an hypothetical Fundamentalist Protestant, or Atheist, and will be either general ‘good’ or ‘bad’ moral decisions. This implies that 4 different types of scenario’s will exist, respectively ‘bad/FP’, ‘bad/A’, ‘good/FP’ and ‘good/A’. A pilot study testing the internal validity of these scenario’s will be conducted in advance of this study. These four variables will be loaded into a 2 x 2 x 4 factorial design. In order to find conclusive effects, each variable contains 12 unique scenario’s (48 in total). After 20 seconds of reading the scenario (time indicated by a clock in the screen), a display will be flashed for 1 sec which contains the text ‘‘Approve or disapprove?’’. After this second, an empty display is presented, which will indicate that the participants should press either the approve or disapprove button, and will display their made decision. Participants will be instructed to answer as fast as possible, as they only have 2.5 seconds to respond (fixed time). After they have

made a decision, a new screen is shown which tells them to “Prepare for the next scenario”. The next scenario will start with a randomized interval between 5 and 10 seconds, ensuring that the task is unpredictable and people stay alert. Every participant will do 3 runs of approximately 10 minutes, in which all the 48 unique scenarios are randomly presented (until all unique scenarios have been shown). This leads to 16 trials per 10 minute run. Each run starts with a 30 second rest state to collect a baseline condition, followed by a 30 second priming block of the chosen condition (Hell or Heaven), and ends with a 30 second resting state. The decision for approximately 30 minutes of scanning time per participant is made due to the high amount of participants. The exact timing of the trials within the run can be viewed in *fig 1*.

Since this fMRI study uses a novel task, it is impossible to state a-priori regions of interests (ROI) and perform a ROI analysis. For this reason, FSL FEAT Flame 1+2 is used to analyse the data across the groups. Since it is known that moral judgement tasks employ a vast amount of brain regions of extended activation, and we want to correct for multiple comparisons, Gaussian Random Field cluster inference is used with z value 2.3. Before analysis, the data of all voxels are to be temporally smoothed to remove variance associated with scanner noise from subject to subject. Within the model, event times (within the model, the start of making the moral decision) were offset by 5 sec to account for the shape of the hemodynamic response. This signal, adjusted for temporal delay, will be entered into a 2 x 2 x 4 mixed-effects ANOVA, where experimental variables of the design will be entered as fixed effects and subjects entered as random effect. As we are looking at clusters, not single voxels, any ROI will be defined as a cluster of at least 15 voxels or more with F values of $p = < .05$. Contrasts between theoretically plausible interactions will be used to explore the nature of their relationships. Surface based registration was used to transform subject functional scans to anatomical, as cortical regions have been shown to be of great importance in moral judgements. To establish whether or not the priming manipulation worked, a questionnaire will be filled in after scanning.

3 Results

A way of visualizing the behavioural results of the experiment can be found in *table 2*. Based on the literature described in the introduction, it is expected that on average, regardless of what type of dilemma, Atheists and Fundamentalist Protestants will significantly approve more bad decisions within their own group as opposed to the other group, and that the concept of hell and heaven will modulate this rate. However, the latter will happen for Fundamentalist Protestants only, where the estimated direction of modulation is presumed to be, *Hell* (more social judging) > less approval of bad moral decisions, *Heaven* (less social judging) > more approval of bad moral decisions. Reaction times will be significantly faster when judging people from the other group as opposed to the own group. Reaction times will also be faster when judging good moral decisions compared to bad. These behavioural results will be collected to serve as clarification for the brain activity data

For the measured brain activity, as hypothesized in the introduction, it is expected that any grand differences in activation might be ascribed to radical different strategies in moral decision making due to religious divine intervention. However, due to how unlikely and comical this would actually be, more smaller differences over the different contrasts will be expected. For judging the scenario's where characters make a bad moral decision (*fig 2.*), we would expect medial and lateral orbito-frontal cortex (OFC) activation, along with the, subcallosal region. In the left hemisphere, the OFC activation extended to the anterior–inferior aspect of the insula will show signs of activation as well. The inferior frontal gyrus is expected to show activation bilaterally, with additional recruitment of the right lateral hypothalamus and the left caudo-lateral OFC/uncus region, all regions associated with disgust and moral indignation (Moll et al., 2005). Consequently, when viewing out groups making these bad moral decisions, we would also expect an absence of medial prefrontal cortex (mPFC) activation, which is associated with dehumanizing outgroup (Harris & Fiske, 2006). It is hypothesized that this absence is stronger for Fundamentalist Protestants than Atheists, as they tend to impose more immorality towards the particular outgroup of Atheists. For the scenarios where characters make a good moral decision (*fig 3*), we would expect postero-inferior postero-medial cortices, anterior cingulate, anterior insula, brain stem and hypothalamus to elicit responses,

associated with admiration of virtue (Immordino-Yang et al., 2009). For the Atheist's, there would be no priming effect, so the variance between the conditions will not be significant, whereas for the Fundamentalist Protestants, the priming effect will have a significant effect on the elicited neural activation response during the moral judgement tasks. However, it is unclear which regions would be effected by this manipulation, as this fMRI experiment is novel, and it is known that making quick moral judgements recruits many brain systems (Casebeer & Churchland, 2003). Further experiments on religious moral reasoning should be conducted in order to establish any neural correlates related to moral judging from specific religious frameworks.

4 Discussion

First of all, the results will conclude if any grand neurophysiological differences exist between religious people and atheists in making fast, everyday life moral judgements. If these do not exist, and the same brain regions and systems are recruited, we can safely dismiss that moral judgement, or being moral as a human, stems from some god given privilege. However, minor differences in regions employed, manipulated through the experimental conditions, show how your sense of morality, and subsequent everyday life moral judgements, can be significantly altered by framing the scenario's in particular ways. This will show more light on how and why we are at times incredibly moral, but have often engaged, and still do, in very immoral acts. These differences, probably have more to do with in-and-out-group values, as it has to do with the divine aspects of religiousness itself. Interestingly, one of the main aspects of religion, is that it automatically creates an in-out-group situation, which could explain why through decades, people from other religions or *infidels* were socially branded as immoral, subhuman and exposed to horrible treatment. A possible positive or negative effect from the priming manipulation of heaven and hell on forgiveness and sin, might tell us more about which concepts of certain religions promote or demote in-out-group violence when consistently primed or apparent in the doctrine of such religions. These findings not only shed light on important neuroscientific topics as moral judgement and decision making, but also on grand societal problems of often, ethnic violence and conflict.

Appendix

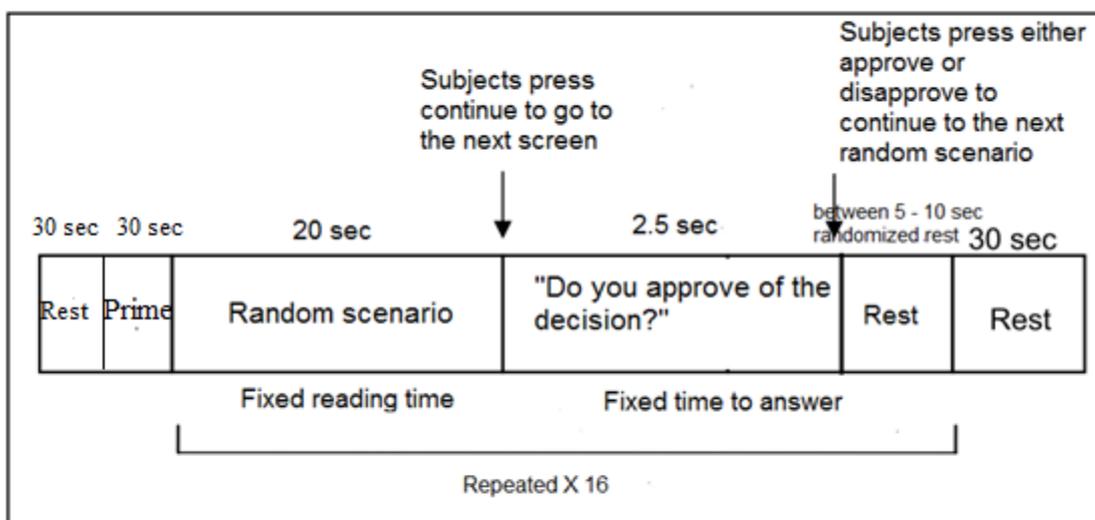


Figure 1. fMRI functional run.

Table 2 Behavioral Data

<i>2 X 2 X 4 Factorial Design</i>								
Group				Atheist				
Prime		Heaven			Hell			
Scenario	GC	BC	GA	BA	GC	BC	GA	BA
% Yes, WRT	73	65	44	52	69	75	65	73
% Yes, WOY	38	33	63	63	8	8	13	8
RT (sec), WRT	2.54 ± 3.03	2.17 ± 2.33	2.41 ± 2.02	2.60 ± 2.38	1.81 ± 1.47	2.24 ± 2.44	2.35 ± 3.35	2.02 ± 1.81
RT (sec), WOY	2.21 ± 1.88	1.74 ± 1.50	2.27 ± 2.92	2.55 ± 2.38	1.67 ± 1.63	1.61 ± 1.60	1.71 ± 1.48	1.55 ± .97
Group				Catholic				
Prime		Heaven			Hell			
Scenario	GC	BC	GA	BA	GC	BC	GA	BA
% Yes, WRT	4	8	4	8	13	54	17	8
% Yes, WOY	92	92	88	92	54	54	8	54
RT (sec), WRT	1.48 ± 1.08	1.40 ± 2.28	2.76 ± 3.02	2.61 ± 2.00	2.23 ± 2.76	4.24 ± 3.30	2.99 ± 2.81	2.22 ± 2.27
RT (sec), WOY	1.27 ± .68	1.37 ± 2.61	2.03 ± 3.61	3.75 ± 3.72	4.09 ± 3.28	3.34 ± 1.99	4.93 ± 3.91	3.12 ± 4.17

percentages of 'approve' responses and mean reaction times for each cell of the experimental design



Fig 2. Lateral orbito-frontal cortex (OFC) activation, along with the, subcallosal region. In the left hemisphere, the OFC activation extended to the anterior–inferior aspect of the insula. The inferior frontal gyrus was activated bilaterally, with additional recruitment of the right lateral hypothalamus and the left caudolateral OFC/uncus region.

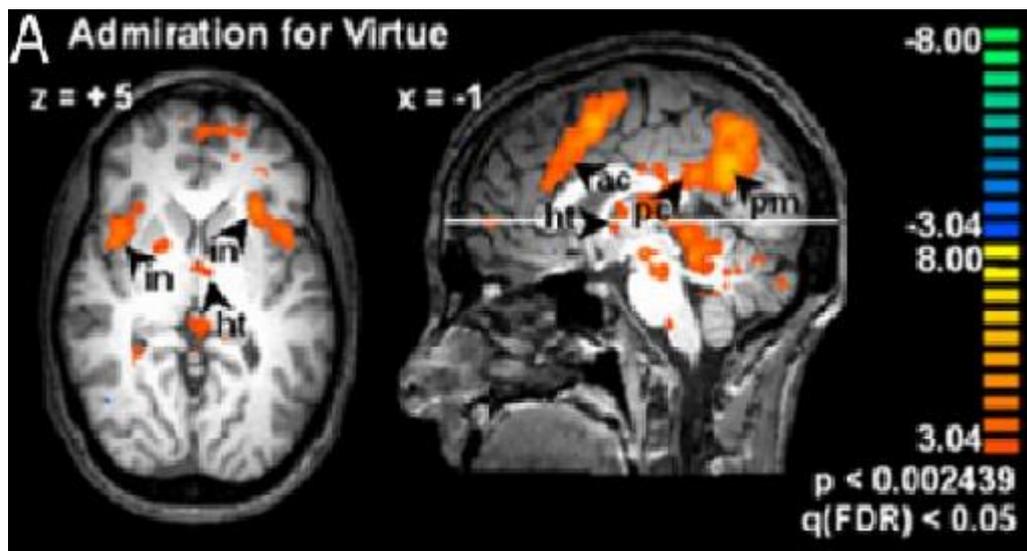


Fig 3. Postero-inferior posteromedial cortices, anterior cingulate, anterior insula, brain stem and hypothalamus responds for admiration for virtue

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