Neural correlates of the motivation to be moral
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Appendices

Appendix A

Supplementary data Chapter 2

Pretest: Testing the Target Stimuli

Stimuli that represented the target concepts in our IAT consisted of 10 pictures of female faces without a headscarf and 10 pictures of female faces with a headscarf. All pictures were pretested by 67 participants (11 males), none of whom participated in the main study. Participants were asked to rate the pictures – that were presented as two groups: i.e., pictures of women with a headscarf and pictures of women without a headscarf were presented all on one screen – on personal characteristics, and ingroup (women without a headscarf) vs. outgroup (women with a headscarf) resemblance on a 7-point scale ranging from "not at all" to "to a great extent". Results showed that, although participants did not evaluate the women in the two groups differently concerning their perceived kindness, intelligence, competence, friendliness, genuinely, and trustworthiness, M(outgroup) = 5.00, SD = 0.63; M(ingroup) = 4.91, SD = 0.64; t(66) = -1.33, ns; they did report to perceive the women with headscarves to differ less from each other and to be more similar to each other than the women without headscarves; M(outgroup) = 3.74, SD = 1.51; M(ingroup) = 2.81, SD = 1.22; t(66) = -5.41, $p < .001$. Moreover, as intended, participants reported that they identified more with women without headscarves (the ingroup) than with women with headscarves (the outgroup); M(outgroup) = 2.60, SD = 1.03; M(ingroup) = 3.94, SD = 1.16; t(66) = 7.96, $p < .001$. The results thus indicated that, as intended, participants identified more with the ingroup. Furthermore, we found a clear ingroup/outgroup differentiation for women with and without a headscarf that is consistent with existing insights that outgroups tend to be perceived as more homogeneous than ingroups. This confirms that the stimuli we developed are suitable for our IAT.

A Pilot Study: Testing the IAT

Using two different task instructions, we framed the IAT as either a test of participant's morality or competence. However, although we argue that the IAT is an appropriate measure for the aim of our study, it is also possible that the test itself (without any additional information) raises morality concerns. After all, it could be evident for participants that a task concerning women with versus women without a headscarf has to do with prejudice or discrimination). We therefore first conducted a pilot study to test our new version of the IAT and to assess how the

test is interpreted by participants.

Method

Participants.

Twenty-six non-Muslim students from Leiden University (11 males, *M* age = 23.2 years, *SD* = 4.8) participated in the pilot study for money or course credits.

The implicit association test.

Stimuli. Besides the stimuli that represented the target concepts of the IAT (i.e., pictures of women with and without a headscarf; described in the pretest), there were also stimuli that represented the attributes. These consisted of 5 pictures of positive scenes (e.g., sun flowers), and 5 pictures of negative scenes (e.g., a tornado), selected from the International Affective Picture System (IAPS; Lang, Bradley, Cuthbert, 2005). The stimuli were selected based on the scores for pleasure (i.e., negative pictures with scores < 4 and positive pictures with scores > 7).

Experimental design.

The design of the IAT was identical to the design used by Greenwald, McGhee, and Schwartz (1998) in which the IAT consisted of 5 blocks. Congruent trials in test block 3 or 5 were trials for which female faces without a headscarf shared the same response key as positive pictures and female faces with a headscarf the same response key as negative pictures. Incongruent trials were trials for which female faces without a headscarf shared the same response key as negative pictures and female faces with a headscarf the same response key as positive pictures. The order of the congruent and incongruent trial blocks (3 and 5) was counterbalanced between participants. Blocks 1, 2, and 4 consisted of 26 trials and blocks 3 and 5 consisted of 156 trials each. Each trial started with a fixation point (with a duration that varied between 500-1500 ms), followed by stimulus presentation to which participants were supposed to respond (680 ms), and a feedback screen (500 ms). The feedback screen indicated whether participants responded correctly (indicated by a green check mark), incorrectly (i.e., a red cross), or whether they responded too late. Stimuli alternated between female faces and positive or negative pictures and the presentation order of stimuli was random. Participants could start each

block themselves and were thus able to take a short break in between. The experiment took approximately 25 minutes.

The IAT effect (*D* score).

The dependent measure was the IAT effect – indicated by the D score – calculated as the difference in reaction times on incongruent and congruent trials divided by a pooled standard deviation of all correct trials. This IAT effect was computed based on the scoring algorithm described by Greenwald, Nosek, and Banaji (2003). However, in contrast to IAT trials of Greenwald et al., where participants are asked to respond as quickly as possible but the stimuli only disappeared after a response was made, we used a limited presentation time of the stimuli (i.e., participants had to respond within 680ms after which the stimulus disappeared from the screen). We therefore did not have trials with extreme long or short latencies and we thus included them all, replaced error latencies with a replacement value (the mean plus two times the standard deviation of the correct latencies) and replaced zero latencies of the trials on which participants did not respond in time with the maximum response time of 680 ms.

Interpretation of the IAT.

After finishing the IAT we asked participants two questions (both positively and negatively formulated) concerning their interpretation of the IAT (i.e., "I think this test can assess my moral values concerning the equal treatment of different groups of people" / "I think this test cannot assess whether I am good in processing [new] information"). Participants could respond on a 7-point scale ranging from 1 "completely disagree" to 7 "completely agree".

Results and Discussion

Interpretation of the IAT.

Participants reported they were more inclined to think the test measured how well they are able to process new information ($M = 4.27$, $SD = 1.34$) than that the test measured their moral values concerning the equal treatment of different groups of people ($M = 3.14$, $SD = 1.80$); $t(25) = 3.44$, $p = .002$. This result thus negates our concern that the IAT raises morality concerns even though this is not made explicit.

IAT effect.

Participants showed the standard IAT effect (i.e., a negative implicit bias towards women with a headscarf); $t(25) = 2.61$, $p = .015$: Responding was more difficult on incongruent than on congruent trials (as was shown by increased reaction times and erroneous responses on incongruent compared to congruent trials). Our test thus revealed the typical IAT effect as it was first introduced by Greenwald et al. (1998).

The Instruction Manipulation

In the main manuscript, we shortly describe the difference between the two instruction conditions of our IAT. Here, we report the complete translation of these instructions.

Morality instruction.

"Is it important to you to treat people from different groups equally? Or do you have discriminating conceptions? Are you convinced that it is good to judge every individual, despite his or her gender, religion or ethnicity, in the same way? Or do you think it is right that some groups have a lower status in the Dutch society? People have different values concerning egalitarianism and discrimination. The test that you are about the do will show what kind of values you have and indicates whether your conceptions are discriminating against certain groups of people. The test is thus about important values you have and to what extent you strive for egalitarianism. The time to respond is limited, try to respond as quickly and as accurately as possible."

Competence instruction.

"Are you able to quickly and accurately respond to new information? Can you asses things very rapidly? Or, are you not able to quickly evaluate and respond to new information? People differ in how well they are able to pick up new information and how easy they can learn new tasks. The test that you are about to do will show how well you are able to process new information en indicates whether you can rapidly and accurately sort different types of pictures. This test is thus about sorting different types of images, a good performance and fast reaction times. The time to respond is limited, try to respond as quickly and as accurately as possible."

Supplementary data Chapter 4

Additional ERP results Study 4.2

Effects of Electrode Site

N1.

A main effect of electrode site for the N1 revealed that the N1 was greater at Cz (M = -7.44 µV, SE = 0.37) than at FCz (M = -6.66 µV, SE = 0.35); $F(1,56)$ = 14.84, p < .001, η^2 = .21. There was also a significant interaction between electrode, face and congruency; $F(1,56)$ = 3.92, p = .05, η^2 = .07. Separate follow-up analyses revealed that there was a significant interaction between electrode and face on incongruent (and not on congruent) trials; $F(1,56)$ = 4.43, p = .04, η^2 = .07, indicating that for incongruent trials the N1 modulation of viewing outgroup compared to ingroup faces was significant at Cz; $M_{\text{difference}}$ = -0.55, SE = 0.26, $F(1,56)$ = 4.34, p = .04, η^2 = .07, but not at FCz; $M_{\text{difference}}$ = -0.07, SE = 0.21, F <1.

P150.

The main effect of electrode site for the P150 showed that this ERP was greater at FCz (M = 5.13 µV, SE = 0.47) than at Cz (M = 4.08 µV, SE = 0.43); $F(1,56)$ = 75.65, p < .001, η^2 = .58. There was also a significant interaction between electrode, face, congruency, task domain, and evaluator; $F(1,56)$ = 5.93, p = .02, η^2 = .10. Follow-up analyses showed that (1) on incongruent (and not on congruent) trials there was an interaction between electrode, face, task domain, and evaluator; $F(1,56)$ = 7.04, p = .01, η^2 = .11; (2) only at Cz (and not at FCz) there was a marginally significant interaction between face, task domain, and evaluator; $F(1,56)$ = 3.57, p = .06, η^2 = .06. Separate analyses per task domain revealed a marginally significant face*evaluator interaction in the moral domain; $F(1,31)$ = 3.39, p = .08, η^2 = .10, but not in the competence domain; F<1. Separate analyses per evaluator type revealed a marginally significant interaction between face and task domain in case of an outgroup evaluator; $F(1,27)$ = 3.14, p = .09, η^2 = .10, but not in case of an ingroup evaluator; $F(1,27)$ = 1.02, p = .32. Simple main effects revealed that the P150 modulation of enhanced social categorization was significant in the morality/ingroup condition ($F[1,31]$ = 12.84, p = .001, η^2 = .29), but not in the morality/outgroup condition (F < 1). And significant in the competence/outgroup condition ($F[1,27]$ = 9.91, p = .004, η^2 = .27), but not in the competence/ingroup condition (F < 1). Note that, besides the fact that we found these effects only at Cz

and incongruent trials, the increased P150 modulation in the morality/ingroup condition is consistent with our hypotheses and previous research (Van Nunspeet et al., 2014).

N450.

Results of the N450 also showed a main effect of electrode site; $F(1,56) = 86.49$, $p < .001$, $\eta^2 = .61$, indicating that the N450 was larger at CPz ($M = -0.44$ μV, $SE = 0.37$) than at Pz ($M = 0.95$ μV, $SE = 0.31$). There was also an interaction between electrode site and face; $F(1,56) = 22.05$, $p < .001$, $\eta^2 = .28$, indicating that the difference in the N450 between viewing non-Muslim (ingroup) compared to Muslim (outgroup) women was greater at Pz; $M_{difference} = -0.77$, $SE = 0.24$, $F(1,56) = 39.27$, $p < .001$, $\eta^2 = .41$, than at CPz; $M_{difference} = -1.38$, $SE = 0.22$, $F(1,56) = 22.05$, $p < .001$, $\eta^2 = .16$. Moreover, there was an interaction between electrode, congruency, and task domain; $F(1,56) = 4.42$, $p = .04$, $\eta^2 = .07$. However, follow-up analyses –separately for each electrode site and for each task domain condition– revealed no significant two-way interactions with congruency; F's < 2.29, p's $> .14$.

ERN.

For the ERN there was only a main effect of electrode site, revealing that the ERN modulation was greater at FCz ($M = -2.95$ μV, $SE = 0.47$) than at Cz ($M = -0.99$ μV, $SE = 0.46$); $F(1,44) = 76.20$, $p < .001$, $\eta^2 = .63$. There were no interaction effects with this factor.

The N450 Modulation of Viewing (non-)Muslim Faces

N450.

As the described in the main manuscript, we found a significant four-way interaction between congruency, face, domain and evaluator; $F(1,56) = 5.75$, $p = .02$, $\eta^2 = .09$. Since we were interested in the modulation of congruency, we included follow-up analyses examining this particular factor. However, we also found a main effect of faces: The N450 was larger for pictures of non-Muslim ($M = -0.28$ μV, $SE = 0.37$) compared to Muslim women ($M = 0.79$ μV, $SE = 0.33$); $F(1,56) = 24.06$, $p < .001$, $\eta^2 = .30$. We therefore also conducted analyses for the N450 modulations of faces: Separate analyses for the task domain conditions revealed a significant interaction between face, congruency, and evaluator in the morality condition; $F(1,31) = 5.36$, $p < .03$, $\eta^2 = .15$, but not in the competence

condition; $F(1,25) = 1.30$, $p = .27$. Furthermore, within the morality condition, there was an interaction between face and congruency in the ingroup evaluator condition; $F(1,16) = 10.26$, $p = .006$, $\eta^2 = .39$, but not in the outgroup evaluator condition; $F(1,15) < 1$. Simple main effects revealed that the N450 modulation of viewing non-Muslim compared to Muslim women in the morality/ingroup condition was significant on incongruent trials; $F(1,16) = 15.68$, $p = .001$, $\eta^2 = .50$, but not on congruent trials; $F < 1$.

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