

Priming, reward, and repetition suppression

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Repetition priming (RP) refers to the phenomenon which facilitates the identification of a specific stimulus after a previous exposure to it (Bunzeck et al. 2006, Summerfield et al. 2008). Evidence from this phenomenon is expressed by the shorter reaction times to the repetition of a stimulus as well as by decrease in hemodynamic response (i.e. repetition suppression).

It is known that reward modulates several cognitive processes, namely attention (Peck et al. 2009), orientation sensitivity (Simoncini & Baldassi, 2008), motivation (Roesch & Olson, 2004), among others. Nevertheless, there is no empirical study to our knowledge that addresses how repetition suppression is modulated by reward.

AIM:

By using fMRI we hope to clarify whether and how the response modulation to the repetitive stimuli presentation takes place according to the context of the stimuli-category (rewarded vs. non-rewarded).

Work Program:

Sixteen healthy subjects (age range 18-32 years; 8 female) will be tested on a 3T Siemens Magnetom Trio MRI system (Siemens, Erlangen, Germany). Stimuli will be 144 greyscale photographs of natural indoor and outdoor scenes (72 each), and 144 isolated male or female faces (72 each) on gray background. All stimuli are matched in size, mean grey value and standard deviation. Subjects will receive 6 runs covering three reward scenarios. The order of presentation will be randomly counterbalanced across subjects.

-In the scene scenario (2 runs), scenes will be the rewarded stimulus-category but only for indoor scenes, while faces (both male and female) will be the non-rewarded stimulus-category.

-In the face scenario (2 runs), faces will be the rewarded stimulus-category but only for female faces, while scenes (both indoor and outdoor) will be the non-rewarded stimulus-category.

-In the neutral scenario (2 runs), nor face- nor scene-categories will be rewarded.

Within each scenario the rewarded stimuli sub-group will be counterbalanced (i.e. female or male faces and indoor or outdoor scenes).

Each subject will perform six runs, each of them with duration of 9.6 min. In total, 57.6 min. of functional scanning time per subject. Each run will contain 12 new images of each category, and each image will be repeated twice, but never consecutively. There will be two to nine images in between the presentation of a stimulus and its repetition. At the beginning of each run subjects will see an image (male/female face or indoor/outdoor scene) for 2000 ms indicating the rewarded stimulus category. Each stimulus will be shown for 1000 ms. Subjects will be told that they will win 50 ct per each triplet of images of the rewarded stimulus category. Subjects will be instructed to perform a category judgment (discriminate between gender (male/female) and scenes (indoor/outdoor)) as fast and as accurate as possible. If they take more than 1000 ms to make a decision they will not be rewarded (reaction time deadline set after Bunzeck et al. (2006) study). The inter-stimulus-interval (ISI) will be jittered in $\frac{1}{2}TR$ steps and optimized by M. Scholz. At the end of each run subjects will receive a feedback of their gains. In total each subject will be presented with 144 trials per run.

The model will contain the 4 stimulus conditions, the rewarded category, and the 2 repetitions of each stimulus. Contrasts can then measure the decrease of activation over repetitions for rewarded or non-rewarded stimuli in the faces or scenes category. In addition to the functional series, we are planning to conduct certain anatomical measurements (T1, MT ratio) which might add 30 to 45 min. to the scanner time. In total approx. 1:45h to 2:00h per subject.

Hypotheses:

- Subjects will decrease their reaction time (RT) and hemodynamic response (HR) for the rewarded stimuli-category;

- Repetition suppression (RT and HR) should also be more pronounced for un-rewarded sub-groups of the rewarded stimuli-category compared to non-rewarded stimuli-category (rewarded female vs. non-rewarded male faces and non-rewarded scenes).