of text number, e.g. on total sentence reading times (F(6, 3701)=27.5, p<0.001).

Conclusion: The results confirm the prediction concerning fixation duration in Russian, but contradict it concerning shorter saccades and more fixation count suggesting that eye movements in silent reading are effected by specific linguistic features of Russian (besides density). Future research might focus on selecting such features and evaluating their impact on silent reading.

doi:10.1016/j.ijpsycho.2018.07.216

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Exploring the brain contour of implicit infra-low frequency EEG neurofeedback: a resting state fMRI study

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Introduction: The most popular neurofeedback techniques are based on the principle of explicit learning when the participant is trained to maintain voluntary control over brain activity. However, implicit fMRI neurofeedback (NF) — presentation of information related to ongoing brain activity when participants pursue no explicit goal and, sometimes, even are unaware of the fact of feedback — is also inducing significant alterations in brain connectivity (Ramot et al. 2016). The implicit approach is used in clinical practice during infra-low frequency (ILF) EEG NF. Although significant clinical effects of the neurotherapeutic ILF NF are described, its neural mechanisms are yet unknown (Othmer et al. 2013).

Methods: 52 healthy volunteers were randomized for a single session of ILF NF or sham NF. Immediately before and after the session a resting state fMRI scanning was performed. To test the hypothetical connectivity alterations related to the neurofeedback contour, we used network-based statistics approach, including into analysis the areas with known or supposed participation in the NF circuit, including fronto-parietal and salience networks hubs, lateral occipital cortex, striatum and thalamus (Emmert et al. 2016).

Results: After real vs. sham NF an increased connectivity was observed through a network consisting of the right and left inferior lateral occipital cortex, right dorsolateral prefrontal cortex and striatum nuclei. The overall intensity of the connections within this network changed significantly greater in post vs. pre resting state fMRI session in the NF compared to the sham NF group (p<0.05, FWE-corrected; cluster-defining threshold at p<0.01, uncorrected). This contour has both similarities and differences with the described in other studies contour of the explicit neurofeedback. Similarities include involvement of the part of the lateral prefrontal cortex associated with the maintenance of working memory, and sensory areas relevant to the visual modality of the feedback (extraction of the feedback information). Important differences are presented by involvement of the striatum but not the salience network. It is proposed that salience network is responsible for conscious perception of reward, while unconscious reward is mediated by striatum. Next, the involvement of right, but not left, prefrontal cortex may be related to the leading role of the right brain in implicit learning.

Conclusions: We described the brain circuit of implicit infra-low frequency EEG neurofeedback, consisting of the lateral occipital cortex, right dorsolateral prefrontal area and striatum.

doi:10.1016/j.ijpsycho.2018.07.217

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Effects of auditory presentations on visual memory processing: A study of Event-Related Potentials

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Introduction: Event-related potentials (P3) time-locked to stimulus onset reflects attentional allocation to that stimuli. In our previous study, participants memorized figures presented with a sound (high-frequency sounds: HS / low-frequency sounds: LS) and subsequently recognized them in a old-new recognition memory test. Results indicated that when the P3 amplitude time-locked to figures presented with LS (LS-figures) increased in the memorizing session, their recognition rate in the recognizing session also improved. These results suggest that LS increased attentional allocation and improved memory consolidation, which corresponded to the results of previous studies (Mather & Sutherland, 2011). The current study investigated whether the recognition rate of LS-figures improved by presenting LS in the recognizing session.

Method: Undergraduate and graduate students ($N = 26$, 16 women and 10 men, Mean age 20.6 ± 0.9 years) participated in this study. They memorized 30 geometric figures [25 with 1259Hz (1000Hz) and 5 with 1000Hz (1259Hz): pitch of sounds was counterbalanced between participants], and subsequently recognized them among 60 figures included new 30 figures. All figures were presented for 1000 ms with HS (25 figures) or LS (5 figures) in the memorizing session and were also presented for 2500 ms with LS in the recognizing session. All sounds were presented for 100 ms in synchronization with the figures. Electroencephalographic was recorded from 20 scalp sites, referenced to the linked earlobes.

Result: The recognition rate of figures memorized with LS (LS-figures) improved more than figures memorized with HS (HS-figures) (LS-figures: 66.1 ± 23.8 %, HS-figures: 58.1 ± 12.6 %, $p < .05$). The P3 amplitude for LS-figures was larger than HS-figures in both memorizing and recognizing sessions (*ps* <.05). Moreover, the P3 amplitude for LS-figures increased when presented with LS (present study) than with no-sound (our previous study) in the recognizing session ($p <. 01$). The recognition rate of LS-figures with no-sound in the recognizing session was 62.0 ± 22.8 %, although there was not different between LS and no-sound ($p = .402$).

Discussion: Our findings suggest that low-frequency sound (rare stimuli) increased attentional allocation and improved memory consolidation for visual stimuli.

doi:10.1016/j.ijpsycho.2018.07.218

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Regulating cognition and emotion - Individuality matters: Biological inheritance, individual and socio-cultural necessity

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Introduction: Network-oriented theories favour models, in which multiple parts of the brain or nested neural networks provide an adaptive neural substrate of complex mental processing. Evidence from neuroscience on functional principles and complex connectivity in the brain, indicates that common, simplifying views, which, for instance, assign cognitive processes to cerebral cortex and emotional processes to limbic system based on biological inheritance theories, need to be reconsidered. On neuronal level, dualistic concepts of top-down and bottom-up processes, are not fully convincing. Concepts