Motor Imagery in Hypnosis: Alpha- and Thetapower during Mental Walking Tasks in Hypnosis
Konrad B.1, Deeb S.2, Scholz, O.B.3
1,2 Friedrich Wilhelm University Bonn, 3 University of Applied Sciences Cologne, Germany

Background
A state-task-model of imagery could explain why motor imagery (as measured with questionnaires) and hypnosis did not yield any linear relationships in research. Valid EEG markers (alpha- and thetapower) valid for motor imagery and for hypnosis. The objective was to analyse differences between high and low hypnosis with regard to changes in the EEG and their relation to subjective hypnogenic experiences.

Objectives
(a) Do alpha- and thetapower produced by high an low imagers differ during walking state, during hypnosis and during an active motor imagery task in hypnosis?
(b) Does a direct comparison of the active hypnogenic condition (motor imagery) with a passive hypnogenic condition (listening to the hypnogenic anecdote) show differences between the alpha- and thetapower production during these phases?
(c) Are differences in EEG-parameters between the two groups reflected in subjective hypnogenic experiences?

Methods
Sample: 47 right-handed participants, 32 women and 15 men, average age 25.27 years (SD = 7.65, Range = 18-32)
Motor Imagery in Hypnosis: A design used by Decety and Jeannerod (1996) was adapted to induce motor imagery in hypnosis. A mental walking task was integrated on a Hypnosis-CD spoken by a qualified hypnotherapist. After a classical hypnogenic induction (10 steps down) followed an imagination journey, during which subjects were asked to imagine walking with a friend through a subway labyrinth. All in all 12 times subjects had to walk mentally through tunnels of different lengths (5m, 5m and 5m and 5m) and gates of different widths (1m, 2m and 1.5m). As a start signal a deep soft gong was used which was anchored beforehand within the induction. Subjects were requested to fill a finger whenever they reached the end of a tunnel and passed through the gates. Total length of the CD depending on the mental walking times of the subjects was about 45 minutes.

Virtue/Need of Motor Imagery Questionnaire (VMQ) (Issac, Marks & Russell, 1986): This scale was created for the assessment of self-reported motor imagery. The questionnaire contains 24 movement imagination questions, ranging from simple (walking) to complex actions which require a high degree of coordination (jumping over a wall).

Relaxation Experience Scales (RES) (Cassidy & Meadmore, 2002): The RES is a self-report measurement designed to assess altered states. First, the subjects describe briefly the experiences they had while listening to the hypnosis-CD. Then, they rate on a 7-point Likert-Scale how they experienced the following relaxation visual and motor imagery and hallucinations, gaitary and haptic imagery, attentional alterations and depth.

Sampling of EEG: Registration followed the guidelines of the International Federation of Clinical Neurophysiology for minimum standards of EEG measurement. Continuous EEG was acquired with the 16-channel DC-amplifier Synamps (Neuromag). A portable 16-channel 10-20 montage for EEG (Fp1, Fp2, F3, F4, T5, T6, C3, C4, P3, P4, O1, O2, T3, T4, Cz, and C1) with an active electrode (Ag/AgCl) with a common reference (A1 and A2, 10 K-Ohm resistance). Ground was applied 3 cm above nasion. Filtering, artifact correction and baseline corrections were conducted automatically with Brain Vision Analyzer (Brainproducts).

Results

Table 1: 

<table>
<thead>
<tr>
<th>Table 1:</th>
<th>1st meeting</th>
<th>2nd meeting</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task type (walking)</td>
<td>Walking</td>
<td>Walking</td>
</tr>
<tr>
<td>Power (Theta)</td>
<td>Theta</td>
<td>Theta</td>
</tr>
<tr>
<td>Power (Alpha)</td>
<td>Alpha</td>
<td>Alpha</td>
</tr>
</tbody>
</table>

Results: Alpha and theta changes from baseline to motor imagery in hypnosis (VMQ) and self-reported intensity of motor imagery in hypnosis (RES)

Discussion
The analysis of EEG-constructs of motor imagery in hypnosis for high and low imagers yielded the following results:
(a) Subjects with low trait imagery according to the VMQ show a statistically significant higher general alpha- and thetapower than subjects with high trait imagery.
(b) Compared to a passive hypnogenic phase both groups produced an increase in occipital alpha activity during hypnosis, but only the group trained during motor imagery in hypnosis – again this increase was independent of trait imagery.
(c) Subjects self-reported hypnogenic experiences were associated with a higher alpha-suppression for those who report more hypnogenic experiences regardless of their trait imagery.
(d) Subjects who reported vivid imagery in hypnosis although they showed low trait imagery showed a particularly high increase of occipital theta and decrease of frontal alpha in hypnosis.

Perspective
(a) Occipital alphaformer and overall thetapower can be used to test induction of hypnotherapy.
(b) Exact predictors of expected intensity of imaginative experiences – at least for motor imagery – are possible.