METHODS

Subjects
9 students (5 female, 4 male; mean age=22.1; range 20 - 25)

Task and Stimuli
In two separate 3-stimulus oddball tasks, we used different stimulus categories (exp. 1: symbols of car brands, Fig. 2; exp. 2: names of clothing brands, Tab. 2). Prior to the experiments, one stimulus with the highest personal significance was selected out of a stimulus pool by the instructor. Each task consisted of 100 overall stimulus presentations in the defined probability ratio. Stimuli were presented in random order, with no detection instruction given [1].

P300 amplitudes were determined with a peak detection algorithm that searched for the maximum amplitude within the time window of 300-600 msec after stimulus onset.

RESULTS

Statistical analysis
Stimulus types varied significantly at both electrode sites P3 (F=19.139; p<.001) and P4 (F=15.607; p<.001). Largest amplitudes were elicited by targets, followed by non-targets, followed by standards, in turn by non-targets. Even in absence of any instructions, non-targets evoked significantly larger P300 amplitudes (P3=0.011; P4=0.004) than standards. Stimulus format (words vs. pictures) varied significantly at P3 (F=7.688; p<.05) and a trend towards significance was observed at P4 (F=3.674; p<.10). P300 amplitudes in response to picture stimuli were larger than those to word stimuli. The ratio of amplitude differences between stimulus types was about equal in both categories. No latency effects were found.

Our findings indicate that the parietal P300 is a sensitive indicator for automatic stimulus categorization driven by personal significance; even if such categorization is irrelevant to an actual task response. These results may be useful for future research on autobiographic memory.

Moreover, in previous ERP studies enhanced P300 amplitudes could be observed for items with personal significance, as ones own name or face [2, 3]. We aimed to extend this research by proving this P300 effect for task-irrelevant but intrinsically significant items in an active oddball task with task instructions for arbitrary target items.

DISCUSSION

As expected, targets elicited significantly larger P300 amplitudes than standards, which is in line with the idea of the standard oddball paradigm [4]. Non-Targets elicited significantly larger P300 amplitudes than standards, which is consistent with prior research results that demonstrate that deviating stimuli evoke a P300 response even if no detection instruction is given [1]. Remarkably, subjects are able to allocate attentional resources on non-targets while producing target P300’s.

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We propose that due to their personal significance, non-targets are elicited in an active oddball paradigm, for both picture and word stimuli, although attention is drawn to a designated target stimulus.

Conclusions
The outcomes demonstrate that a P300 effect for personally significant stimuli occurs even though attention is drawn toward the task instruction in an active oddball paradigm, with the same probabilities for both instructed targets and meaningful but physically equivalent non-targets.

References