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### MEETING ABSTRACT

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#### Impact of temperature challenges on directed forgetting in young men

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**Background:** Successful memory performance requires remembering of new encoded information as well as forgetting the old out-of-date information, thus updating of the memory system. Depending on whether a stressor is applied before encoding or before memory retrieval, stress responses promote either an increase or a decrease in memory performance. In long-term memory performance, a stress-related increase in cortisol before or immediately after the stressor facilitates memory consolidation, whereas a stress-related cortisol increase before memory retrieval impairs memory recall performance. Despite the well-documented dichotomy of cortisol on memory performance in long-term memory, less is known about the impact of cortisol in short-term memory performance. In the present study, we evaluated the impact of a cold-water stressor on memory recall as well as on the association of endogenous cortisol on memory performance in young men. In directed forgetting paradigms, subjects are instructed to forget a previously encoded list of items, but to memorize a subsequent list of items. In general, subjects recall less of the forget-cued list (list-1 forgetting) but recall more of the remember-cued list (list-2 enhancement).

**Methods:** Sixty-three young men participated in the present study: 21 men exposed their lower arm either to warm water, 21 to ice-cold water, and 21 subjects were used as a control group. Salivary cortisol was quantified using an ELISA assay (Demeditec Diagnostics GmbH, Germany). The directed list-forgetting paradigm used in the present study consisted of two lists of words. Each list consisted of 12 words. After encoding list items, the participants received a “forget list 1, remember list 2” cue. In the temperature-challenged groups, water exposure was immediately before list-1 encoding.

**Results:** Sixty-seven % of the participants responded to cold pressor stress (CPS) with an increase in free cortisol. Baseline and post-test cortisol levels were significantly associated with each other in CPS conditions ( $R^2 = 0.61$ ;  $t = 5.14$ ;  $p < 0.001$ ). Cortisol-responders revealed lower baseline salivary cortisol levels than cortisol non-responders. The subjects recalled  $30.7 \pm 3.6\%$  of the list-1 items in control conditions and  $36.5 \pm 5.4\%$  of the list-1 items in CPS conditions. Cortisol non-responders recalled  $16.7 \pm 3.3\%$  in control and  $58.6 \pm 12.7\%$  in CPS conditions. Cortisol-responders recalled a similar percentage of list-1 items in control ( $35.9 \pm 4.7\%$ ) and CPS conditions ( $32.7 \pm 5.3\%$ ). Regression analysis revealed a negative association between baseline cortisol level and the percentage of recalled list-1 items ( $R^2 = 0.22$ ;  $t = -2.31$ ;  $p < 0.05$ ).

**Discussion:** As the participants revealed a higher recall rate in CPS conditions, our findings indicate that list-1 forgetting is mitigated in temperature-challenged subjects. Furthermore, the present study indicates an association between free cortisol levels and recall of forget-cued items. Thus, at least in men, elevated baseline cortisol levels may impair recall of encoded items in a short-term memory paradigm.

**Keywords:** directed forgetting – memory performance – impact of temperature – cortisol – men

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