

difference in the size of the N4 to semantically congruent vs. incongruent word-pairs. The goal of this study is to assess the presence of the N4 effect in healthy seniors, and those with amnesic mild cognitive impairment (MCI) or mild AD, and to evaluate associations between performance on the Repeatable Battery for the Assessment of Neuropsychological Status (RBANS) and the N4 across these samples.

Participants and Methods: Fifty older adults (intact=27, combined MCI/mild AD group=23; “impaired”) completed neuropsychological testing, including the RBANS, as part of a larger study. Participants were re-contacted and returned for EEG assessment between several weeks to one year later. During EEG recording, participants completed a word-pair judgement paradigm, which involved distinguishing between semantically congruent and incongruent word-pairs. Data was collected and analyzed according to customized N4 analysis scripts provided as part of ERPCORE, an online resource for acquiring and analyzing common ERP components (Kappenman et al., 2021; <https://osf.io/thsqg/>). The change in N4 amplitude between congruent and incongruent trials (the N4 effect) was used as an index of participants’ semantic functioning. Participants’ N4 effect was quantified using the mean amplitude from 300-550 milliseconds post-stimulus at electrode Cz.

Results: Repeated measures ANOVAs indicated a significant effect of trial type on the N400 amplitude in the intact individuals ($F(1, 26)=77.66, p<.001$), which remained significant in the sample as a whole ($F(1, 48)=65.18, p<.001$). Although intact participants numerically showed a larger N4 effect (intact: $M=-4.02, SD=2.37$; impaired: $M=-2.60, SD=3.40$), the expected group-by-trial interaction was not significant ($F(1, 48)=3.01, p=.089$). Correlational analyses revealed no significant associations between the N4 effect and the RBANS Total Scale scores ($r=-.14, p=.32$), nor for the Immediate Memory ($r=-.002, p=.99$), Visuospatial/Constructional ($r=-.069, p=.63$), Language ($r=-.15, p=.30$) Attention ($r=-.21, p=.14$), or Delayed Memory ($r=-.18, p=.58$) indexes.

Conclusions: Results confirmed the presence of the N4 effect in intact participants and in the sample as a whole. Although the N4 effect was numerically smaller in the impaired group as expected, this difference was not significant in the present sample. Likewise, we observed no evidence for associations between the size of

N4 effect and performance on RBANS indexes. Overall, the present study provides mixed evidence for the utility of the N4 as a biomarker in mild AD. Factors that may have contributed to the lack of associations between the N4 effect and the RBANS include the limited sample size and variable lengths of time between participants’ initial cognitive assessments and EEG testing.

Categories: Neurophysiology/EEG/ERP/fMRI

Keyword 1: dementia - Alzheimer’s disease

Keyword 2: electroencephalography

Keyword 3: neuropsychological assessment

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60 Neural Correlates of the Self-Reference Effect: Neuronal Mechanisms Supporting Self-Referential Encoding

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Objective: Self-concept is a mental representation of the self—an internal sense of personal identity. This complex representation is unique to the human mind. Behavioral studies on self-concept have demonstrated that self-relevant information is remembered better than other types of information, a phenomenon commonly known as the “self-reference effect” (SRE). However, the underlying neural mechanisms of SRE remain largely unknown.

Participants and Methods: Here, we recorded neural activity from ~600 neurons from 15 neurosurgical epilepsy patients, who were implanted with depth electrodes for seizure monitoring. The SRE paradigm consisted of an incidental learning (encoding) task and subsequent memory recognition test. During the incidental learning task, participants were asked to rate various personality traits in three distinct encoding conditions: the self, a friend, and a celebrity. In the recognition part of the task, participants were asked to distinguish between traits that were presented during the encoding

phase (old) and traits that were not presented (new).

Results: Our behavioral findings showed the highest memory accuracy on the recognition test for traits that were associated with the “self” condition, which is consistent with previous studies on SRE. Additionally, we found that traits associated with the “friend” category were more accurately recognized than those associated with a celebrity, indicating that personally familiar information—even if not self-related—improves memory recognition. Through single-unit analyses from target brain regions, including the medial temporal lobe (MTL) and medial prefrontal cortex (mPFC), we identified unique patterns of neural activity during the memory encoding phase, specifically increased responses during self-referential encoding in a subset of the neuronal population.

Conclusions: Future analyses will explore the relationship between increased MTL activity during self-referential encoding and improved memory recognition of traits rated in relation to the self, and network interactions between MTL and mPFC in self-oriented memory processes.

Categories: Neurophysiology/EEG/ERP/fMRI

Keyword 1: memory: normal

Keyword 2: temporal lobes

Keyword 3: neurophysiology

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61 Robustness of Attention Networks Across Multiple Sessions: Behavioral and ERP Findings

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Objective: Attention is the backbone of cognitive systems and is requisite for many cognitive processes vital to everyday functioning, including memory, problem solving,

and the cognitive control of behavior. Attention is commonly impaired following traumatic brain injury and is a critical focus of rehabilitation efforts. The development of reliable methods to assess rehabilitation-related changes are paramount. The Attention Network Test (ANT) has been used previously to identify 3 independent, yet interactive attention networks—alerting, orienting, and executive control (EC). We examined the behavioral and neurophysiological robustness and temporal stability of these networks across multiple sessions to assess the ANT’s potential utility as an effective measure of change during attention rehabilitative interventions.

Participants and Methods: 15 healthy young adults completed 4 sessions of the ANT (1 session/7-day period). ANT networks were assessed within the task by contrasting opposing stimulus conditions: cued vs. non-cued trials probed alerting, valid vs. invalid spatial cues probed orienting, and congruent vs. incongruent targets probed EC. Differences in median correct-trial reaction times (RTs) and error rates (ERs) between the condition pairs were assessed to determine attention network scores; robustness of networks effects, as determined by one-sample t-tests at each session, against a mean of 0, determining the presence of significant network effects at each session. Sixty-four-channel electroencephalography (EEG) data were acquired concurrently and processed using Matlab to create condition-related event-related potentials (ERPs)—particularly the cue- and probe-related P1, N1, and P3 deflection amplitudes, measured by using signed-area calculation in regions of interest (ROIs) determined by observation of spherical-spline voltages. This enabled us to examine the robustness of cue- and probe-attention-network ERPs.

Results: All three attention networks showed robust effects. However, only the EC RT and ER network scores remained significantly robust [$t(14)s > 13.9, ps < .001$] across all sessions, indicating that EC is robust in the face of repeated exposure. Session 1 showed the greatest EC-RT robustness effect which became smaller during the subsequent sessions per ANOVAs on Session x Congruency [$F(3,42) = 10.21, p < .0001$], reflecting persistence despite practice effects. RT robustness of the other networks varied across sessions. Alerting and EC ERs were similarly robust across all 4 sessions, but were more variable for the