Background: Working memory (WM) impairment is characteristic for schizophrenia patients, lowering their occupational status and quality of life. Recent research suggests that non-invasive brain stimulation could have the potential to treat such cognitive deficits. One novel and promising approach is the transcranial alternating current stimulation (tACS) which could entrain the endogenous gamma oscillations in the dorsolateral prefrontal cortex (DLPFC), previously shown to be abnormal in schizophrenia patients and associated with WM deficits. Indeed, first studies demonstrated WM improvement in healthy participants following tACS at the gamma frequency (γ-tACS) to the DLPFC in healthy participants. However, till date, there is only one pilot study with ten schizophrenia patients, where cognitive enhancement was not evident. Here, we aimed to investigate the efficacy and feasibility of γ-tACS on simultaneous WM performance in schizophrenia patients with a bigger study sample and in regard of cognitive load.

Methods: A total of fifteen patients with schizophrenia (N = 15, 8 female) participated in the current study. They underwent a pre-stimulation baseline, an active γ-tACS and a sham single-session in a double-blind, cross-over design. Stimulation was administered over the left DLPFC (F3, anode) and the contralateral region (F4, cathode) at a current of -1mA to 1mA (peak-to-peak) at 40 Hz for 20 min (48000 cycles). We assessed WM during stimulation using a verbal n-back task with three cognitive loads (1- to 3-back). Reaction times and discriminability index d prime served as primary study outcomes. Using several RM-ANOVAAs, we compared working memory performance during γ-tACS and sham across all cognitive loads.

Results: Data analysis showed no significant main effect of γ-tACS compared to sham on both d prime values (p = .269) and reaction times (p = .166). However, we observed a significant stimulation x load interaction effect on reaction times (p = .043), suggesting that with increasing cognitive load participants responded slightly slower during active than during sham γ-tACS.

Discussion: The current work is one of the first to investigate the effects of γ-tACS to the DLPFC on simultaneous WM performance in schizophrenia patients. In line with previous research, we did not find any significant changes in cognition due to stimulation. Surprisingly, we observed a slight decrease in WM speed with higher cognitive load during active compared to sham tACS. Results are discussed in line of study protocol and tACS feasibility and emphasize the need for future research on the specific study design parameters.

T55. DETECTING SEMANTIC DISTANCE ABNORMALITIES IN PSYCHOSIS: QUANTIFICATION OF WORD ASSOCIATIONS USING SEMANTIC SPACE MODELING

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Background: Language Disorganisation is central to the conceptualization of psychosis. Disruptions in semantic processing have been observed both as a “state”, and a “trait” phenomena in psychotic disorders. Quantification of semantic abnormalities have been improved with recent advances in semantic modeling. The current study applied such computational methods on a word association task, using immediate response to cue words to explore semantic associations. We employed a longitudinal design to investigate semantic relationships during a psychotic episode compared with the same patients after remission six months later, in order to clarify the state-trait status of the semantic variables, and their relationships with clinical symptoms. We hypothesized that semantic distance would be significantly greater in patients than controls at baseline, and would decrease upon follow-up.

Methods: A continued word association task (WAT) was employed to elicit three associations per cue from a set of 200 cue-words. The set of cues were previously established as being representative of words in general speech, in terms of valence, concreteness and part-of-speech composition. The task was administered to 47 patients with schizophrenia spectrum disorders and 44 matched healthy control participants. Data was collected at two time points, at baseline when patients were actively psychotic and then at 6-months follow-up. In addition, extensive clinical and cognitive measures were collected at both time points. Patterns of word associations were explored using vector representations, derived from Word2Vec, that encompass semantic meaning. Semantic distance of each cue-response pairing is defined using the cosine angle of their vectors. Changes in semantic distance were further examined on their correlation with symptom change over time.

Results: There was a significant interaction between group and time point on semantic distance (F = 6.865, p = 0.009), where measures of the semantic distance of patients’ responses were significantly greater than healthy controls at both time-points (p < 0.001). There is a significant time effect: the semantic distance reduced significantly over time (p < 0.001). Within the patient group, a change in semantic distance was correlated with symptom change over time, specifically with general psychopathology (p = 0.024), depressive (p = 0.046) and manic symptoms (p < 0.01).

Discussion: Measures of semantic distance were significantly greater in patients both at baseline during a psychotic episode, and at follow-up upon clinical remission. There is a significant but not full normalization of semantic distance upon remission. Increase in semantic distance is therefore both a state and a trait marker in psychosis. We have employed a novel technique to quantify semantic distance of a word association task using Word2Vec to generate vector representations of responses in a high-dimensional semantic space. The findings illustrate the feasibility of applying Word2Vec to a word association task to detect subtle changes in language. Subsequent research possibilities using this approach includes exploration of the semantic content of responses, by grouping similar meaning responses into conceptual clusters, and its correlation with symptom change.

T56. RISKY DECISION-MAKING IMPAIRMENT IN EARLY-STAGE PSYCHOTIC BIPOLAR DISORDER

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Background: Previous research suggests that bipolar disorder may be associated with increased risk-taking / impulsivity. Risky decision-making paradigm is an objective, performance-based measure which has been increasingly applied in bipolar disorder research examining. Nonetheless, literature focused only on chronically ill samples, with illness chronicity, clinical heterogeneity and prolonged medication exposure being potential confounding factors of study results. The current study aimed to explore whether patients with early-stage psychotic bipolar disorder (BDP) exhibit impaired risky decision-making relative to healthy controls, using a well-validated, widely-applied experimental paradigm of Balloon Analogue Risk Task (BART).

Methods: Thirty-nine patients with early-stage BDP (defined by having received psychiatric treatment for first-episode BDP within 3 years since service entry) and 36 demographically matched healthy controls were recruited. BART was administered to examine risky decision-making performance. Deliberative risky behavior was operationalized as the willingness to inflate balloons as each pump was accompanied by an extra point gained in the temporary repository or balloon explosion. Three performance-based indices (adjusted score, explosion rate and cumulative score) were derived and analyzed.

Results: There were no significant differences between patients and controls in age, gender and educational levels. Independent samples t-tests illustrated that
patients had significantly lower adjusted score ($t = -3.45$, $p = .001$, $d = .791$), explosion rate ($t = -2.75$, $p = .007$, $d = .631$) and cumulative score ($t = -3.07$, $p = .003$, $d = .714$) in BART compared to controls. Similar findings were obtained when comparison analyses were restricted to patients who were treated with antipsychotic medications at the time of study assessment ($n = 30$). No significant correlations between BART performance-based indices and measures of clinical and treatment variables were found in patient sample.

**Discussion:** Our results demonstrated that early-stage BDP patients displayed suboptimal risky decision-making compared with controls. Abnormal risky decision-making observed in the euthymic state of patients in early stage of bipolar disorder suggests that such impairment might represent a trait factor in the disorder. Further prospective research is warranted to clarify the longitudinal course of risky decision-making impairment in bipolar disorder.

**T57. IMPAIRED FACIAL EMOTION RECOGNITION IN INDIVIDUALS AT ULTRA-HIGH RISK FOR PSYCHOSIS: CORRELATIONS WITH SCHIZOTYPY AND PARANOID LEVEL**

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**Background:** Schizophrenia patients and individuals at ultra-high risk for psychosis (UHR) have shown impaired facial emotion recognition (FER). Previous studies have reported lower accuracy and negative bias of FER in schizophrenia and UHR. These impairments have been studied with various factors such as schizotypy and paranoid level, but the results were inconsistent. This study aimed to identify the impairments of FER in UHR individuals and further to examine how these impairments relate to schizotypy and paranoid level.

**Methods:** Forty-three UHR individuals and 57 normal controls (NC) were requested to perform the facial emotion recognition (FER) task that consist of 60 facial photographs selected from standardized photographs of Ekman and Friesen series. For exploratory correlation analysis, schizotypy (Revised physical anhedonia scale, Magical ideation scale) and paranoid level (Paranoia scale, Persecution/suspicious item of Positive and Negative Syndrome Scale) were also examined in UHR individuals.

**Results:** The UHR individuals showed lower accuracy rate for total FER task ($70.6\%$ vs. $75.6\%$, $p = 0.010$) and more “fear” responses for neutral faces ($14.5\%$ vs. $6.0\%$, $p = 0.003$) than NC. In exploratory correlation analysis for UHR individuals, the total accuracy rate of FER task showed significant correlation with both scales for schizotypy, but not with both scales for paranoid level. Among threat-related emotion response rates for neutral face, only “Disgust” response rate for neutral face was correlated with all scales for paranoid level, but not with scales for schizotypy in UHR individuals.

**Discussion:** In this study, we could identify inaccuracy and negative bias of FER in UHR individuals. Furthermore, we found that inaccuracy and negative bias were associated with schizotypy and paranoid level, respectively. These findings imply that inaccuracy and negative bias of FER in UHR individuals are of different nature. Future studies on the clinical implications of these findings would be needed.

**T58. EFFECTIVENESS OF ORALLY ADMINISTERED CO-ENZYME Q10 FOR SCHIZOPHRENIA: COGNITIVE, FUNCTIONAL AND BIOCHEMICAL OUTCOMES FROM A DOUBLE BLIND, RANDOMISED, PLACEBO CONTROLLED TRIAL**

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**Background:** Coenzyme Q10 (CoQ10) is an endogenous compound that is essential for energy production within the mitochondria and also functions as a potent anti-oxidant, inhibiting oxidative stress and damage. Often deficits in CoQ10 are associated with fatigue, and cognitive and psychological impairment. In light of its many functions, CoQ10 supplementation to minimise decline and improve symptoms has been investigated in multiple disorders including neurological and neuropsychiatric disorders, with results indicating positive effects on fatigue, cognitive impairment and affective difficulties for disorders such as bipolar disorder and chronic fatigue syndrome. There is also evidence of mitochondrial dysfunction in schizophrenia. In light of this evidence, the current study aimed to investigate the potential effect of CoQ10 supplementation on 1) cognitive function and 2) psychological and physical health in schizophrenia and schizoaffective disorder.

**Methods:** A double blind, randomised, placebo controlled study was conducted to assess the effects of CoQ10 supplementation (300mg/day) on cognitive, psychological and physical variables in 70 patients with schizophrenia and schizoaffective disorder. The effects of CoQ10 supplementation were compared to placebo at 3 and 6 months. Plasma CoQ10 was measured at all time points, along with measures of mitochondrial function (via plasma lactate concentration). Sensitivity analysis followed an intention to treat approach that used multiple imputations to account for missing values.

**Results:** Overall there was no effect of CoQ10 supplementation on cognitive outcome measures. This is despite observing an increase in plasma CoQ10 concentration in the CoQ10 group compared to the placebo. CoQ10 supplementation also had no effect on mitochondrial function, energy, psychological symptoms, quality of life, functional status, physical activity or blood pressure at either time point.

**Discussion:** There is considerable evidence that mitochondrial dysfunction is present in patients with schizophrenia and schizoaffective disorder, and this dysfunction is implicated in the manifestation of cognitive impairment and clinical symptoms. CoQ10 can be taken as a nutritional supplement with minimal side effects to target mitochondrial dysfunction via promoting ATP generation and increasing antioxidant capacity. However, we found no effect of CoQ10 supplementation on any variable under investigation. It is possible that CoQ10 might act as a protective agent against exacerbated oxidative stress in these patients, and future studies might be warranted to examine this possibility. However, the current data is conclusive that CoQ10 supplementation does not ameliorate existing deficits in schizophrenia. These findings are translatable to clinical and community settings.

**T59. ACOUSTIC SPEECH MARKERS FOR SCHIZOPHRENIA**

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**Background:** Clinicians routinely use impressions of speech as an element of mental status examination, including ‘pressured’ speech in mania and ‘monotonous’ or ‘soft’ speech in depression or psychosis. In psychosis in particular, descriptions of speech are used to monitor (negative) symptom severity. Recent advances in computational linguistics have paved the way towards automated speech analyses as a biomarker for psychosis. In the present study, we assessed the diagnostic value of acoustic speech features in schizophrenia. We hypothesized that a classifier would be highly accurate (~ 80%) in classifying patients and healthy controls.

**Methods:** Natural speech samples were obtained from 86 patients with schizophrenia and 77 age and gender matched healthy controls through a semi-structured interview, using a set of neutral open-ended questions. Symptom severity was rated by consensus rating of two trained researchers,