Theme 10 Cognitive and Psychological Assessment and Support

P299 COMMUNICATION IN CLIS ALS PATIENTS USING A VIBROTACTILE P300 AND MOTOR IMAGERY-BASED BRAIN COMPUTER INTERFACE

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Keywords: communication, complete locked-in, brain computer interface

Background: In the disease’s advanced stages, ALS patients gradually lose any chance to communicate via speech and most devices, often leading to the complete locked-in syndrome (LIS), in which even eye-coded answers are not possible. Among tracheotomy invasive ventilated patients, which account for 10–30% of ALS patients in Italy, nearly 20% can’t communicate by any means. Consequently, there is no information about their needs or wishes, or feedback on the effectiveness of the care interventions. Visual P300-based brain computer interface (BCI) spellers allow communication independent from motor control, but have been shown to be variably effective for LIS ALS patients, as a result of oculomotor impairment. Gaze-independent BCI systems can provide a communication tool for patients who are unable to interact with the environment by other means.

Objectives: To evaluate the efficacy of a vibrotactile (VT) P300 and motor imagery (MI) BCI in providing effective communication in LIS and CLIS ALS patients.

Methods: Three CLIS and four LIS ALS patients at our Clinical Research Center were enrolled in this study and participated in a BCI session. Each session included two VT runs (with three and three stimuli) and one MI run. In the VT paradigm, the patient had to mentally count vibrotactile stimuli perceived on the skin of the right or left hand. In the MI paradigm, the patient is asked to perform a motor imagery task consisting of imagining writing with the left or right hand. Patients exceeding the communication threshold for VT and/or MI proceeded to an individualized binary communication session (yes/no). To evaluate the communication’s effectiveness, the VT and MI communication each asked the patient five customized questions that could be unequivocally answered with “Yes” or “No.” Visual feedback on the computer’s screen indicated the patient’s selected answer.

Results: In the VT paradigm, six of the seven patients obtained a VT accuracy exceeding the communication threshold and obtained successful functional communication through the BCI. In the MI paradigm, two patients communicated effectively. One CLIS patient was partially able to perform the required mental tasks but could not communicate.

Discussion and conclusions: This study shows that two visual independent BCIs, based on VT P300 and MI, allow reliable yes/no communication in patients unable to communicate by other means. These approaches have the potential to improve the quality of care in the very advanced stages of the disease and provide the patient with decision-making autonomy, potentially including end-of-life choices. The results of assessment and communication could also be useful in assessing conscious awareness and cognitive functioning in late stage ALS patients.

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P300 CHANGES IN COGNITIVE PROFILE DURING THE COURSE OF 6 MONTHS IN ALS

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Keywords: cognition, longitudinal, behavior

Background: Up to 50% of ALS patients show cognitive deficits. The aim of the present study was to observe a cross-sectional and a longitudinal observation of changes in cognition in a large population of patients with ALS using Edinburgh cognitive and behavioral amyotrophic lateral sclerosis screen (ECAS). Longitudinal studies on cognition in ALS are still rare.

Subjects and methods: ALS patients (N=373) who consecutively attended an ALS outpatient clinic were included. N=63 of the patients received a second assessment after six months (9.68 ± 3.70 months). Cognitive profile was assessed with the revised German version of the ECAS including ALS-specific (language, verbal fluency, and executive function), ALS-nonspecific (memory, visuospatial), and an overall score of cognitive function. Age and education adjusted cut-offs were used. Behavioral and psychotic symptoms were assessed with a caregiver interview of ECAS. Disease status was measured with the ALS Functional Rating Scale-Revised (ALSFRS-R) and progression rate was determined. Association of cognitive profile and behavioral symptoms, disease status and progression rate were evaluated.

Results: Both overall score and all the subtest scores remained stable when comparing the results of the first
and second testing (for all \(p>0.05\)). Cognitive deficits were seen in 54% of the patients. Patients most commonly had deficits in subtests measuring language (30%), visuospatial functions (23%), and verbal fluency (20%). Deficits in executive functions and memory were observed in 19% and 15% of the patients, respectively. Behavioral changes were observed in 28% and psychotic symptoms in 2% of the patients. ALSFRS-R score was associated with ECAS total score (\(R^2=0.025, \beta=0.157, p=0.003\)), language (\(R^2=0.018, \beta=0.136, p=0.011\)), executive functions (\(R^2=0.03, \beta=0.173, p=0.001\)), memory (\(R^2=0.03, \beta=0.173, p=0.001\)) and visuospatial functions (\(R^2=0.021, \beta=0.146, p=0.007\)). Progression was associated with total score (\(R^2=0.012, \beta=-0.107, p=0.047\)) and memory (\(R^2=0.023, \beta=-0.15, p=0.005\)). Behavioral changes correlated with the sum score of ALS nonspecific domains (\(p=-0.114, p<0.05\)) and memory (\(p=-0.105, p<0.05\)).

Discussion: In the current study, patients with ALS presented no changes in cognition over the course of 6 months. According to previous suggestions, cognitive changes might evolve before motor deficit, which might partly explain the results. Prevalence of cognitive deficits was congruent with earlier findings. In contrast to earlier results, more advanced disease status was associated with lower scores. Low ALSFRS-R score, fast progression, and behavioral changes presented no changes in cognition over the course of 6 months. According to previous suggestions, cognitive changes might evolve before motor deficit, which might partly explain the results. Prevalence of cognitive deficits was congruent with earlier findings. In contrast to earlier results, more advanced disease status was associated with lower scores. Low ALSFRS-R score, fast progression, and behavioral changes were most commonly associated with lower score in memory task.

Conclusion: We provide intriguing evidence that half of the patients in a large clinical sample may present with cognitive deficits. However, changes during the course of ALS may be minor.

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P301 COPING STRATEGIES, GENDER, AND DISEASE SUBTYPE IN MND/ALS

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Keywords: coping, subtype, TONiC

Background: Emphasis has been placed upon the importance of early and continuous evaluation of coping, to ease the emotional distress experienced by those with motor neurone disease (MND/ALS), and of providing support to patients so that they can cope during the disease progression (1). Active coping has also been shown to influence survival (2). Thus, an understanding of coping strategies employed may help in the management of this challenging condition.

Methods: An ongoing, longitudinal study in the UK (TONiC), consenting people with MND/ALS completed a questionnaire pack which contained a variety of Patient Reported Outcome Measures (PROMs). The pack was designed to populate the biopsychosocial model, including impairments of function, activity limitation, participation, quality of life, and various psychological attributes such as coping, utilizing the Cope60 questionnaire (3).

Results: Four hundred and sixty-five persons with MND/ALS were recruited by March 2016. Mean age was 64.8 years (SD 10.8), with 60.8% male. Mean duration was 28.4 months (SD 37.5), ranging from 0–186 months. Of this 29.2% had Bulbar onset, which differed significantly by gender (Chi-Square 18.5 (df 1); \(p=0.001\)). Males (21.4%) had this type of onset, compared with 41.9% of females. Those enrolled with Bulbar onset also had a significantly shorter duration (17.7 months) than those with Limb onset 31.2 months (t = 3.75; \(p<0.001\)), but were slightly older (66.6 vs 63.7 years). The majority (78.3%) were retired. Generally, the type of onset did not affect the coping strategies employed. Only “venting” emotions differed, with this strategy used significantly more by those with Bulbar onset (Mann–Whitney U test, \(p=0.001\)). However, this may have been a reflection of gender, as the strategy was employed significantly more by females (Mann–Whitney U test, \(p<0.001\)), along with other strategies such as disengaging and denial.

Conclusions: It appears that different coping strategies are employed by males and females; the latter engaged with more negative coping aspects such as denial.

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P302 COGNITIVE CHANGES AND IMPACT ON CLINICAL CHOICES IN ALS

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Keywords: end of life decision-making, cognitive/behavioral impairment, clinical management

Background: Cognitive and behavioral changes can be seen in as many as 60% of ALS patients and can potentially impact decision-making in ALS.

Objectives: Our team reviewed the effect of cognitive or behavioral changes captured with the Penn State
Cognitive Screening Test conducted on key clinical decisions (Riluzole use, noninvasive ventilation (NIV) use, feeding tube placement, and end of life choices as captured through the Provider Order for Life Sustaining Treatments (POLST) form).

Methods: Cognitive assessments occurred over an 18 month period (June 2010–January of 2012) with a 5-year follow-up on average, until death or discontinuation of care from our center. Cognitive screening (COGNISTAT, letter and category fluency), frontal behavior inventory (FBI), Beck Depression Inventory, and ALS-specific clinical data were analyzed using logistic regression.

Results: The data set included 30 subjects; average age at onset 55.4 years, 52% female, 26% bulbar onset. The average ALSFRS at first visit was 38/47 with an average decline of 0.7 points/month. Median survival was 3.5 years. Fifty percent of patients had cognitive impairment in at least one of the COGNISTAT test domains. Eleven percent of patients had significant behavioral impairment defined as an FBI score of 27 or higher. Twenty-eight percent had moderate-to-severe depression. Seventy-five percent of patients with impaired judgment defined as an FBI score of 27 or higher. Twenty-eight percent had moderate-to-severe depression. Seventy-three percent of the patients chose to go on the drug Riluzole (41% of which eventually stopped the drug). Fourteen patients (47%) underwent gastrostomy and 21 patients (30%) used NIV. Nineteen patients (63%) had at least one POLST with 5 patients choosing comfort care, 11 limited interventions, and 3 patients full code. Eleven patients (37%) had no POLST order on file. Seventy-five percent of patients with impaired judgment stopped Riluzole vs 33% of patients with intact judgment (p=0.15). Patients with impaired memory were less likely to use NIV (40% vs 86%, p=0.04). Of those patients with depression 50% were using NIV vs 89% of patients without depression (p=0.1). Patients with impaired cognition were less likely to have a POLST (36% vs 82%, p=0.02). Patients who were DNR and opted for comfort care (n=16) were less likely to have any cognitive impairment (20% vs 55%, p=0.22).

Discussion and conclusion: While none of the above findings were significant after multiple test corrections, several interesting trends were observed. Impairment in cognition leads to less likelihood of accepting standard of care such as NIV and Riluzole, while opting for more aggressive end of life choices. In addition, depression appears to be a treatable condition that can affect choices in ALS management.

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P303 OVERCOMING VERBAL-MOTOR LIMITATIONS IN ALS: A NEW EYE-TRACKER-BASED NEUROPSYCHOLOGICAL BATTERY

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Keywords: eye-track, cognitive assessment, verbal-motor limitations

Background: Cognitive assessment in amyotrophic lateral sclerosis (ALS) is often prevented due to the presence of verbal-motor impairment; therefore, traditional screening tools are not always feasible for such patients (1). Eye-tracking (ET) has been increasingly employed in ALS as an alternative and augmentative communication device, proving to be fast and accurate (2). As part of an extended project, we preliminarily discussed the feasibility of this approach for cognitive testing in ALS (3,4).

Objectives: The study aimed to firstly adapt an extensive range of neuropsychological tests for ET control, covering language, attention, executive functions, and social cognition; evaluate sensitivity and validity aspects, together with usability components, of the developed battery, in a sample of controls and ALS patients.

Methods: Eighteen ALS patients (16 males, 2 females) and 18 healthy participants (10 males, 8 females) underwent an ET-based cognitive assessment and standard cognitive screening tools (Frontal Assessment Battery; Montreal Cognitive Assessment; Digit Sequencing Task). Psychological measures of anxiety (State-Trait Anxiety Inventory-Y) and depression (Beck Depression Inventory) were also collected, and an ET usability questionnaire was administered. For patients, clinical, respiratory, and behavioral assessment (Frontal Behavioral Inventory) were also performed.

Results: Patients obtained significantly lower performances than controls at most ET-based neuropsychological tests (p values always <0.05), except for measures of verbal comprehension and social decision-making. Perceived usability was not significantly different between the two groups, with concern to both positive (patients: 63.40 ± 8.59, controls: 64.54 ± 5.38, range 12–84, p = 0.68) and negative scores (patients: 15.93 ± 8.11, controls 16.62 ± 4.91, range 7–49, p = 0.79). Preliminary analysis on controls revealed significant correlations between ET-based and standard cognitive tests (p<0.05).
Discussion and conclusions: The developed ET-based neuropsychological battery provides an extensive and motor-verbal free assessment of cognitive functions. Results showed a satisfying level of sensitivity of the developed approach, useful in highlighting also slight cognitive changes in ALS patients, and good usability in our population.

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P304 SELECTIVE ATTENTION IN AMYOTROPHIC LATERAL SCLEROSIS PATIENTS: NEUROPSYCHOLOGICAL EVALUATION BY USING AN EYE-TRACKING SYSTEM APPROACH

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Keywords: eye-tracking system, neuropsychology, attention

Background: Amyotrophic lateral sclerosis (ALS) is a progressive disorder that involves degeneration of the motor system at all levels. Degeneration of other elements of the nervous system has been described, particularly at postmortem level. Overlap with other neurodegenerative diseases is sometimes seen; some patients have associated frontotemporal dementia (FTD) (1). Bulbar-onset patients present with slurring of speech (dysarthria), difficulty in swallowing (dysphagia), or both. Dysexecutive function is a prominent component of the cognitive profile in ALS, and associated with adverse prognosis. The assessment of cognitive impairment still remains a problematic issue in ALS patients, because of severe physical disabilities, including movement impairment, paralysis in the advanced stages and dysarthria, which interfere with the outcome of traditional neuropsychological testing (2). New technologies to enable communication have been recently used in several studies, such as Eye-Tracking System (ETS). It is an advanced device for communication that requires efficient oculo-motor activity and the ability to correctly point to each letter/number of the screen keyboard.

Objectives: Our main aim is to evaluate selective attention in patients with ALS, particularly in patients with bulbar involvement, by using an ETS device.

Methods: We enrolled 30 patients (15 bulbar and 15 spinal) and 20 age- and sex-matched healthy controls. We explored the selective attention by using the Attention Matrices in an electronic version we implemented for use with an ETS device. Such a PC-delivered test is useful to evaluate speed, detection capacity, interaction between working memory, and visual/attentional processes: its purpose is to measure the capacity of selection in a visual search situation. The test was administered twice a year.

Results: Healthy controls reported normal scores. Among patients, those with spinal involvement had little (if any) impairment of selective attention, whereas bulbar ones showed attentive deficits.

Conclusion: Our study suggests that the ETS device we developed is suitable to assess attention in ALS patients: we found that bulbar involvement is associated with relevant deficits of selective attention. We plan in the near future to carry out studies on other cognitive functions, in order to set up an ETS battery for neuropsychological testing of ALS patient’s overtime along their disease course, which could be used even in the worst/latest disease stages.

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P305 THE RELATIONSHIP AMONG ONSET TYPE, NEUROPSYCHOLOGY AND FDG-PET BRAIN METABOLIC CHANGE IN AMYOTROPHIC LATERAL SCLEROSIS

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Keywords: amyotrophic lateral sclerosis, neuropsychology, metabolic imaging

Background: Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease of the central nervous system, however, research on the cortex in ALS has been insufficient. FDG-PET is a sensitive tool to reflect abnormal cortical metabolism, which is appropriate to evaluate patients with ALS.
Methods: Twenty-five patients with ALS were included in this study and they underwent comprehensive cognitive assessment, behavior, and mood evaluation. Then, FDG-PET was performed on all of them. They were divided into bulbar onset group (B-ALS) and spinal onset group (S-ALS) based on their onset type. We analyzed the differences between these two groups.

Results: Eight patients had B-ALS while the other 17 had S-ALS. B-ALS performed poorer than S-ALS in many neuropsychological tests, however, these differences did not reach statistical significance. Disinhibitive behavior score of B-ALS was significantly higher than that of S-ALS. Brain metabolism was significantly lower in several frontal and temporal areas in B-ALS than those in S-ALS.

Conclusion: B-ALS was more severe in the aspect of cognitive impairment and abnormal behaviors, which were in accordance with changes in brain metabolic imaging. These findings supported the theory that bulbar neurons had extensive connection with the cortex, and that ALS is a heterogeneous disease.

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P306 BULBAR, MOTOR, AND LANGUAGE IMPAIRMENT INTERACTIONS IN ALS

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Keywords: bulbar, language impairment, bulbar motor assessment

Background: Up to 40% of patients diagnosed with ALS exhibit language impairments. Word retrieval, sentence comprehension, and spelling are commonly affected in the disease process (1,2). A number of studies suggest that patients with the bulbar form of ALS are most vulnerable to language abnormalities (3). However, this association has been disputed (4).

Objective: To establish the association between bulbar motor and language deficits in ALS.

Methods: Data was collected from five sites in a standardized protocol in the Canadian ALS Neuroimaging Consortium (CALSNIC), and is currently available for 20 patients with ALS and 20 healthy controls. All participants underwent 1) detailed bulbar motor testing (7), which included the assessment of laryngeal, respiratory and articulatory subsystems; 2) testing of speaking rate and intelligibility (8); and 3) language testing via the Edinburgh Cognitive ALS Screen (9). The patient group also underwent a neurological assessment, pulmonary function testing and ALS-Functional Rating Scale (ALSFRS-R). The analyses included 1) comparisons of bulbar performance measures between groups using parametric and nonparametric tests; 2) variable reduction with principle component analysis; 3) correlational analyses of bulbar measures and language scores; and 4) comparisons of language scores between patients with and without bulbar signs as defined by ALSFRS-R, speaking rate, and bulbar motor assessment.

Results: Results indicated that measures of speech intelligibility (p<0.001), speaking rate (p<0.001), articulatory rate (p<0.001), % pause (p=0.038), pause duration (p=0.001), number of pauses (p<0.001), and mean speech duration (p=0.043) are significantly affected in ALS as compared to the healthy controls. Spearman’s correlational analysis revealed a moderate, positive association of language scores with speaking rate (r=0.036) and articulatory rate (r=0.055). Patients with clinically impaired speaking rate (<150 words per minute) had lower language scores (p=0.013).

Discussion: Patients with objectively identified bulbar ALS showed impairment in language function whereas those without bulbar disease did not. For clinicians, understanding the language deficit in ALS and its relation to motor deficits has significant implications for improving the assessment procedures, patient sub-grouping, and treatment of ALS.

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P307 THE EDINBURGH COGNITIVE AND BEHAVIORAL ALS SCREEN IN A CHINESE AMYOTROPHIC LATERAL SCLEROSIS POPULATION

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Keywords: ECAS, Chinese version, effective

Objective: The existing screening batteries assessing multiple neuropsychological functions are not specific to amyotrophic lateral sclerosis (ALS) patients and are limited to their physical dysfunctions, whereas category cognitive tests are too time-consuming to assess all the domains.
The Edinburgh Cognitive and Behavioural ALS Screen (ECAS) was recently developed as a fast and easy cognitive screening tool specifically designed for patients. The purpose of the study was to validate the effectiveness of the Chinese version in Chinese ALS populations.

**Methods:** Eighty-four ALS patients and 84 age-, gender-, and education-matched healthy controls were included in this cross-sectional study. All the participants took the ECAS, Mini-Mental State Examination (MMSE), and Frontal Assessment Battery (FAB). Primary caregivers of patients were interviewed for behavioral and psychiatric changes.

**Results:** Significant differences were noted in language \((p<0.01)\), fluency, executive function, ALS-specific functions, and ECAS total score \((p<0.01)\) between ALS patients and controls. The cut-off value of the total ECAS score was 81.92. Cognitive impairment was observed in 35.71% of patients, and 27.38% exhibited behavioral abnormalities. The ECAS total score had a medium correlation with education year. Memory was more easily impaired in the lower education group, whereas verbal fluency and language function tended to be preserved in the higher education group. The average administration time of ECAS was only 18 min.

**Conclusion:** The Chinese version of the ECAS is the first screening battery assessing multiple neuropsychological functions specially designed for the ALS population in China, which provides an effective and rapid tool to screen cognitive and behavioral impairments.

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**P308 EDINBURGH COGNITIVE AND BEHAVIORAL AMYOTROPHIC LATERAL SCLEROSIS SCREEN (ECAS) VERSUS EXTENSIVE NEUROPSYCHOLOGICAL EXAMINATION: A COMPARATIVE STUDY IN A SPANISH ALS COHORT**

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Keywords: cognition, ECAS, behavior

**Background:** Up to 50% of patients with ALS develop cognitive symptoms and behavioral impairment. This cognitive impairment ranges from frontotemporal dementia, to executive cognitive impairment and nonexecutive cognitive impairment. Neuropsychologists play an important role in multidisciplinary ALS Units for this reason. Deficits in executive function, language, social cognition, and memory are identified in complete neuropsychological examinations. However, this test requires a great deal of time and is exhausting for patients. The Edinburgh Cognitive and Behavioural Amyotrophic Lateral Sclerosis Screen (ECAS) have proven to be highly sensitive to cognitive impairment in ALS. The ECAS is a single method for measuring cognitive change across European centers, for harmonization of cognitive screening and comparison of cognitive phenotypes, and has been validated in various countries in Europe. The ECAS was found to be sensitive to the types of impairment typically present in ALS patients.

**Objectives:** To compare the advantages and shortcomings of ECAS with those of extensive neuropsychological examination in a Spanish ALS cohort.

**Materials and methods:** Nineteen ALS patients were recruited from our ALS outpatient clinic. The site of onset in this series was limb in four cases, bulbar in 10 cases, and simultaneous bulbar and limb in five cases. The mean age at neuropsychological examination was 63.5 years old \((SD 9.1; range 49–78 years)\). The group of patients underwent ECAS and extensive neuropsychological examination over two consecutive days.

**Results:** The mean time required to complete ECAS was 20 min, compared to 3 h for extensive neuropsychological examination. The important advantages of ECAS are that it can be administered by a psychologist or a neurologist, and it can be performed in a short time, and retesting is possible every 3–6 months. However, extensive neuropsychological examination must be performed by a certified neuropsychologist and requires a much longer period before retesting. Some of the advantages of extensive neuropsychological examination compared to ECAS are that it can be administered to illiterate patients; it enables classification of the type of dementia, identifies mild cognitive changes, detects depression, and improves quantification of diminished cognitive flexibility.

**Conclusions:** ECAS is easy to administer in ALS Units, can be retested every 3–6 months, although it is less sensitive when detecting mild cognitive deficits in illiterate patients and in patients with flexibility and depression. According to these findings, cognitive, and behavioral evaluation should start with extensive neuropsychological examination and be followed up every 3 or 6 months with ECAS.

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**P309 VALIDATION OF THE EDINBURGH ALS COGNITIVE AND BEHAVIORAL SCREEN (ECAS) IN CANADA**

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Keywords: cognitive impairment, ECAS, screening tool

**Background:** Popular cognitive screening tests do not accommodate for motor disability and fail to address the
Results: Forty-three percent of patients were below the UK-based cut-off for the ECAS Total score. Group density associations with the ECAS. Reduced GM density was associated with lower ECAS total scores in the anterior medial prefrontal cortex (p<0.001) in patients.

Discussion and conclusions: We report a higher proportion of cognitive impairment than in previous studies using the ECAS (1,2). The association of the ECAS and neuropsychometric battery provides supportive construct validity. Furthermore, neuroimaging analysis on a subset of patients demonstrated prefrontal associations. To our best knowledge this is the first report of neuroimaging associations with the ECAS, and supports the relevance of the ECAS in ALS wherein frontotemporal degeneration is the substrate for cognitive changes. The North American version of the ECAS is a good option for Canadian ALS clinics to consider for assessment of cognitive impairment. However, it is important to establish region-based cut-off scores especially given the absence of normative data for the North American ECAS.

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**P310 JAPANESE VERSION OF THE ALS-FTD-QUESTIONNAIRE (ALS-FTD-Q-J)**

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Keywords: frontotemporal dementia, behavioral variant, caregivers

Objective: Patients with amyotrophic lateral sclerosis (ALS) may have symptoms of frontotemporal dementia (FTD) including behavioral and character changes. These nonmotor changes may negatively influence the disease course of ALS by reduced adherence to therapeutic interventions and may affect relations with caregivers and family. It is therefore essential to evaluate the presence of behavioral changes in ALS patients. An easy screening procedure may contribute significantly in this evaluation.

Methods: The aim of the present study is to validate an existing screening procedure for behavioral changes in Japanese ALS patients and those with behavioral variant FTD (bvFTD). We translated the ALS-FTD-Questionnaire, developed in the Netherlands, into Japanese (ALS-FTD-Q-J) and examined the clinimetric properties (internal consistency, construct and clinical validity). Patients with ALS and/or bvFTD were evaluated alongside healthy controls in this multicenter study. All ALS patients, regardless of bvFTD status, were further evaluated by the Frontal Behavioral Inventory (FBI), the Hospital Anxiety and Depression Scale (HADS), the ALS Functional Rating Scale-Revised (ALSFRS-R), the Frontal Assessment Battery (FAB), the Montreal Cognitive Assessment (MoCA), the letter fluency index, and the upright vital capacity as percent of predicted (%VC).

Results and conclusion: Data from 146 subjects from 18 institutions in Japan were analyzed: ALS (92), ALS-bvFTD (6), bvFTD (16), and healthy controls (32). The internal consistency of the ALS-FTD-Q-J was good (Cronbach $\alpha = 0.919$). The ALS-FTD-Q-J showed construct validity as it exhibited a high correlation with the FBI ($r = 0.79$). However, correlations were moderate with anxiety/depression and low with cognitive scales, in contrast to the original report, i.e. a moderate correlation with cognition and a low correlation with anxiety/depression. The ALS-FTD-Q-J discriminated ALS patients from (ALS-) bvFTD patients and controls. Thus, the ALS-FTD-Q-J is useful for evaluating Japanese ALS/FTD patients.

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**P311 CLINICAL USEFULNESS OF MOCA FOR THE DETECTION OF COGNITIVE IMPAIRMENT IN AMYTROPHIC LATERAL SCLEROSIS PATIENTS**

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**Keywords:** MoCA, cognitive impairment, FAB, MMSE

**Background:** Recently, the presence of cognitive impairment in amyotrophic lateral sclerosis (ALS) is widely accepted. Previous studies showed that the frontal lobe dysfunction occurred in a subset of ALS patients. However, it is uncertain which battery is suitable for the detection of cognitive impairment in ALS.

**Objective:** Three neuropsychological batteries were evaluated to clarify their clinical usefulness for detecting the cognitive impairment in ALS patients.

**Method:** Seventy-three inpatients with ALS in the period between March 2013 and March 2016 were enrolled. ALS cases were diagnosed using the revised El Escorial criteria, and possible, probable, or definite ALS cases were included in this study. The cognitive functions of the ALS cases were evaluated using the Mini-Mental State Examination (MMSE), the Frontal Assessment Battery (FAB), and the Montreal Cognitive Assessment (MoCA). Familial ALS patients were excluded from this study. The patients were regarded as cognitively impaired when the scores of the batteries were lower than the cut-offs of 24 on the MMSE, 11 on the FAB, and 26 on the MoCA. The patients were classified into three groups (Group N: patients obtained the scores higher than the cut-offs with all three batteries, Group M: patients obtained the scores higher than the cut-offs with any two batteries, Group D: patients obtained the scores lower than the cut-offs with any two or three batteries). Each item of the subscales of three batteries was also analyzed.

**Results:** In total, 57 patients met the inclusion criteria of this study. Among them, 12.3%, 7.0%, and 61.4% of the patients showed the scores below the cut-offs on the MMSE, FAB, and MoCA, respectively. All patients in Group M showed the score lower than the cut-offs on the MoCA. The ages at examination in Group N were younger than other two groups, but there is no statistically significant differences on initial symptoms (upper limb, lower limb, and bulbar), disease duration, the ALS-FRS-R score and the Norris scales (limb and bulbar) among three groups. There were significant differences among each group on the scores of MMSE. On the FAB and MoCA, Group N showed higher scores than Group M or Group D with significant differences. On the MoCA subscale analyses, items for language, memory recall, and trail making B task were significantly impaired, especially, language was impaired about 40% patients of Group N. This result corresponds to the previous reports. The scores for conceptualization, which is the most impaired on the FAB subscale, is worse in the FAB than MoCA.

**Conclusions:** MoCA is potentially the most useful battery for detecting the cognitive impairment in ALS patients at the early stage than FAB or MMSE.

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**P312 NEW INSIGHT INTO THE CORTICAL CORRELATES OF EXTRA-MOTOR CLINICAL PROFILES IN NONDEMENTED ALS PATIENTS**

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**Keywords:** cognition, behavior, cortex

**Background:** In approximately 50% of ALS patients, motor symptoms are accompanied by a spectrum of cognitive and behavioral symptoms, ranging from mild cognitive or behavioral impairment to frontotemporal dementia. Past consensus criteria proposed behavioral (ALSbi) and/or dysexecutive (ALSci) impairment as the two main clinical profiles of extra-motor manifestations in nondemented ALS patients (1). A recent study, however, documented a third dimension of cognitive impairment in ALS, including language, social cognition, and episodic memory as a separate and relevant cognitive phenotype in ALS patients (2).

**Objectives:** To determine if the observed heterogeneity of cognitive and behavioral dysfunctions may reflect specific patterns of involvement of cortical structures subserving behavior, executive function, language, social cognition, and memory.

**Methods:** Forty-eight cases of probable or definite ALS without dementia and 26 healthy control (HC) subjects underwent an extensive cognitive and behavioral assessment. The patients were classified according to the criteria recently proposed by Consonni et al. (2), which include a nonexecutive cognitively impaired group (impaired language, memory and social cognition). Nineteen patients presented mild cognitive (ALSci) and/or behavioural impairment, 28 were cognitively normal (ALScn). All participants underwent a structural 3T brain magnetic resonance imaging. Measures of cortical thickness (CT) were calculated with a region-wise approach after automatic parcellation of the cerebral cortex. ANCOVA was used to test between-group differences using age as a covariate with false discovery rate correction. Partial correlations were used to study the relationship between brain regions showing CT reduction and behavioral and cognitive measures.
Results: All ALS subgroups had cortical thinning in motor and extra-motor cortical regions, with greater extra-motor involvement compared to HC in ALScl/bi. Specifically, ALScl/bi patients showed a larger CT reduction of the bilateral temporal pole, left insula, right inferior temporal sulcus, and left lateral sulcus than HC and ALScn. Executive dysfunction correlated with cortical thinning of frontal regions, language impairment with fronto-temporal-insular cortex, memory performances with fronto-temporal areas. CT reduction of right temporal and right frontal regions was related, respectively, to behavioral changes and emotional face recognition deficits.

Discussion and conclusion: The heterogeneity of cognitive and behavioral profiles of ALS patients, which extend beyond executive dysfunction, reflects relative differences in the distribution of cortical thinning within fronto-temporal regions typically affected in the fronto-temporal lobar degeneration spectrum.

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P313 THREE SINGLE-CASE STUDY COMPARISON OF APATHY ON THE FTD-MND SPECTRUM

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Keywords: apathy, frontotemporal dementia, single case

Background: Apathy is a clinically observable symptom on the frontotemporal dementia-motor neurone disease (FTD-MND) spectrum (1) and has been noted as prevalent in FTD patients with the C9orf72 repeat expansion (2). In nondemented MND patients the characteristic deficit is Initiation apathy – a lack of motivation to self-generate thoughts (3). A direct comparison of how apathy subtypes differ in patients on the FTD-MND spectrum has yet to be undertaken.

Objective: To compare apathy profiles and awareness in an FTD patient and FTD-MND patient with and without the C9orf72 repeat expansion, using robust single-case methodology.

Method: A 65-year old C9orf72-negative behavioral variant FTD (C9-bvFTD), a 64-year old C9orf72-positive behavioral variant FTD (C9 + bvFTD) and a 67-year old C9orf72-positive behavioral-variant FTD-MND (C9 + bvFTD-MND) patient, and their carers, were recruited from the Edinburgh Cognitive Diagnosis Audit Research and Treatment Register. The ECAS was used to screen patients for cognitive and behavioral impairment. They completed self-rated and carer-rated Dimensional Apathy Scale (DAS), measuring Executive, Emotional and Initiation subtypes (3,4), the standard Geriatric Depression Scale (GDS) and Apathy Evaluation Scale (AES). Thirty age- and education-matched healthy control participants (15 males and 15 females) were recruited as a baseline-reference group for Crawford et al’s comparing two single-case methodology and analyses (5), with a corrected multiple-comparisons significance threshold.

Results: All patients were cognitively impaired on the ECAS (C9-bvFTD score =92; C9 + bvFTD =38; C9 + bvFTD-MND =81). Furthermore, the C9- and C9 + bvFTD patients showed more behavior change (5/5 domains), with psychosis, compared to the C9 + bvFTD-MND patient (3/5 domains), who showed no psychosis. Based on DAS cut-offs on self- or carer-ratings (3), the C9 + bvFTD-MND patient displayed Executive apathy. The C9 + bvFTD and C9-bvFTD patients were globally apathetic over all subtypes. When looking at discrepancy scores (difference between carer- and self-ratings), only the C9-bvFTD patient showed a lack of awareness over all apathy subtypes compared to the C9 + bvFTD patient (Executive-t (29) =4.29, p=0.00009, Emotional-t (29) =2.60, p=0.008, Initiation-t (29) =4.56, p=0.0004) and also the C9 + bvFTD-MND patient (Executive-t (29) =5.20, p=0.00007, Emotional-t (29) =2.87, p=0.004, Initiation-t (29) =4.28, p=0.00009).

Discussion and conclusion: At an individual case level, the C9 + bvMND-FTD patient showed a demotivation for planning, organization and attention (Executive apathy). The C9 + bvFTD and C9-bvFTD patients displayed indifference and emotional neutrality (Emotional apathy), Executive and Initiation apathy. Furthermore, only the C9-bvFTD patient showed a notable impairment in awareness on all apathy subtypes. This provides insight toward differing apathy profiles on the FTD-MND spectrum. Research should explore this further, emphasizing the importance on screening for apathy subtypes and designing person-centered interventions.

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P314 EMOTIONAL LABILITY IN ALS: DELINEATING THE RELATIONSHIP BETWEEN LABILITY, PSYCHOLOGICAL STATUS, COGNITION, AND BEHAVIOR

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Keywords: Emotional Lability, cognition, behavior

Background: Emotional lability (EL) is reported to occur in 19–49% of patients who have a diagnosis of Amyotrophic Lateral Sclerosis (ALS). The Emotional Lability Questionnaire (ELQ) is designed to measure EL in patients with ALS. It includes a self and proxy-rated version.

Objectives: The aims of this study were to (1) investigate the prevalence of emotional lability on a population-based sample of ALS patients; (2) investigate the relationship between EL and cognitive, behavior and psychological status; (3) investigate caregiver burden in carers of patients with emotional lability, compared to carers of patients who do not present with emotional lability.

Methods: Seventy-five incident ALS patients were recruited from the National ALS Multidisciplinary Clinic in Beaumont Hospital (Dublin, Ireland) as part of an ongoing longitudinal study looking at staging, and cognition in ALS. Emotional lability was assessed using the self-rated version of the Emotional Lability Questionnaire (ELQ) i.e. crying, laughing, and smiling without intent. Cognitive status was assessed using the Edinburgh Cognitive ALS Screen (ECAS) and behavior was screened using the behavioral carer interview from the ECAS. Psychological status was assessed using the Hospital Anxiety and Depression scale (HADS) and Caregiver burden interview (ZBI). Additionally, the ALS Functional Rating Scale (ALSFRS-R) was used to assess disease progression. Exclusion criteria included the presence of co-morbid neurological and/or psychiatric conditions.

Results: Patient sample was split into two groups, those who endorsed an emotional lability symptom (“emotionally labile group,” n=26) and those who did not endorse it (“nemotially labile,” n=49). The two groups were equivalent for age (p=0.889), education (p=0.461) and disease progression (ALSFRS-R score, p=0.405). There was no significant difference between the two groups in terms of ECAS total score (p=0.354), ECAS behavioral carer interview (p=0.211), HADS Anxiety (p=0.165), HADS Depression (p=0.876), and ZBI (p=0.246). The crying subscale of the ELQ was the most commonly endorsed subscale within the “emotionally labile” group in comparison to the smiling and the laughing (p=0.024) subscales, and this represented a change since the onset of ALS. Furthermore, crying as a symptom of emotional lability was more frequently endorsed in males compared to females (p=0.031).

Discussion and conclusions: Thirty-five percent of the sample endorsed an emotional lability symptom. Demographical and clinical characteristics such as disease progression were not related to emotional lability. Emotionally labile patients were not significantly different in terms of cognitive, behavioral, and psychological status, and carers of patients who endorsed emotional lability did not report significantly higher burden scores. The most common symptom of emotional lability in this sample was crying and this was significantly more frequent in males. Longitudinal studies will allow us to further elucidate the progression of EL in ALS.

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P315 DISTINCT PATTERNS OF COGNITIVE BEHAVIORAL CHANGE IN EMERGING FTLD IN THE PRESENCE AND ABSENCE OF MND SUPPORT: A ‘BOTTOM-UP’ MODEL OF FTLD ONSET

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Keywords: executive functioning, cognitive decline, behavioral decline

Background: Estimates of the prevalence of cognitive or behavioral impairment (ci or bi) in MND consistent with Frontotemporal Degeneration (FTLD) approach 50%, while only about 15% progress to dementia.

Objectives: Our goal was to explore ci and bi gender and site of onset differences, in comparison to a nonmotor sample.

Methods: We administered a comprehensive neuropsychological assessment battery comprised of language and executive functioning measures, as well as the Frontal Systems of Behavior (FrSBe). We applied independent sample t-tests to evaluate differences in cognitive and behavioral profile between gender and site of onset in 10 female and 10 male nondemented MND participants and 20 nonmotor variant participants classified by current consensus criteria with ci with or without bi.

Findings: Gender analyses of each subgroup found better naming ability for bulbar (p=0.052) and non-bulbar onset (p=0.046) females. Non-bulbar females also performed better on a Guilford measure of cause and effect in relationships (p=0.024). No gender differences were detected for FrSBe behavioral domain T-scores within motor and nonmotor subtypes, including Apathy, Disinhibition, and Executive Dysfunction. However, analysis of MND by site of onset subtypes evidenced a greater degree of FrSBe Apathy (p=0.017) and Executive Dysfunction (p=0.053) for bulbar onset.
Conclusions: Findings support a hierarchical hypothesis of FTLD emergence in ALSbi and ALSsci, distinct from nonmotor variants, implicating “bottom up” ascending cerebellar-midbrain-prefrontal pathways in MND.

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P316 A POPULATION-BASED BIOPSYCHOSOCIAL INVESTIGATION OF CAREGIVER QUALITY OF LIFE IN ALS

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Keywords: caregiver burden, quality of life, biopsychosocial

Objective: Few studies in amyotrophic lateral sclerosis (ALS) have accurately profiled disease specific features, alongside caregiver burden, anxiety, depression, and distress, and investigated quality of life and patient survival. We report results from a cohort of ALS patients and their primary informal caregivers.

Methods: Eighty-four ALS patients and their primary caregivers were enrolled to this study. Patient-caregiver dyads engaged in a detailed interview of their health-service utilization. Patients completed ALS-specific measures of physical functionality and cognitive status, while caregivers completed measures of anxiety, depression, burden, and quality of life. Survival data were obtained through the national register for ALS to perform survival analyses stratified by burden severity.

Results: Participants were dichotomized based on their reports of caregiver burden. High burdened caregivers (n=43) did not significantly differ from low burdened caregivers (n=41) considering all ALS-specific characteristics. However, significant differences were reported on subjective measures of anxiety (p=0.001), depression (p<0.000), distress (p<0.000), and quality of life (p<0.000). Survival was not implicated by high levels of caregiver burden, considering early (p=0.446), middle (p=0.488), and late (p=0.373) comparisons of the survival curve.

Discussion: These data confirm that caregivers of people with ALS experience significant burden. Considering a matched cohort of patients and caregivers, this study shows that the subjective experience of individual caregivers, rather than disease trajectory or patient survival, is an important determinant of caregiver burden.

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P317 NEED FOR PSYCHOTHERAPY IN PATIENTS WITH ALS AND THEIR RELATIVES

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Keywords: psychotherapy, psychosocial counselling

Background: Being confronted with various limitations in physical function and social interaction, ALS patients and their relatives are forced to perform numerous adaptive processes in the course of the disease. Psychosocial interventions, including psychotherapy, have not yet been established as standard of care for ALS in Germany. Data on prevalence of depression and anxiety in ALS are inconsistent.

Objectives: We aimed to assess the psychiatric symptom load and need for psychosocial support measures in ALS from a patient’s and relatives’ perspective.

Methods: 154 ALS patients and their relatives or caregivers were studied using a questionnaire on the prevalence of psychiatric symptoms, problems caused by physical disability or difficulties in social interactions. Furthermore, the questionnaire addressed the perceived need for psychosocial support or counselling.

Results: Eighty-two percent of patients (n=135) reported disabilities in one or more domains. The majority of the patients (52%, n=45) perceived no need for psychological or psychosocial support. However, 28% of patients (n=24) and 39% of caregivers (n=27) perceived the need for professional psychological support. Among the patients with need for psychosocial interventions only a minority (10%, n=9) received psychotherapy.

Discussion: In accordance to other previous findings, the prevalence of psychiatric symptoms in ALS seems to be relatively low. Despite perceived disabilities, more than half of the ALS patients felt no need for psychological interventions. Caregivers perceived a higher need for psychological support than patients. Among the patients with perceived need for professional psychosocial support only 10% received psychotherapy. Our results indicate unmet needs for psychosocial interventions in ALS.

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P318 EXPLORING PATIENT AND PUBLIC INVOLVEMENT IN MOTOR NEURONE DISEASE

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Keywords: Patient involvement, thematic analysis, research methods

Background: Patient and public involvement (PPI) enables those with the unique experience of living with a disease to inform and improve research. The Sheffield
Motor Neurone Disease Research Advisory Group (SMNDRAG) was established in 2009 to support all aspects of MND/ALS research. As PPI is a relatively recent initiative there are many areas of uncertainty. These include the most effective ways to involve patients and the public as well how PPI impacts on research (1).

**Objectives:** To explore participants’ experiences of participating in the SMNDRAG as well as the barriers and enablers to participation. To explore the experiences of clinicians and scientists who collaborate with the SMNDRAG and the impact that the group has had on research.

**Methods:** We recruited members of the SMNDRAG including patients, carers, and charity workers as well as clinicians and scientists with whom they collaborate. Convenience sampling allowed recruitment of participants with a range of backgrounds and experiences. We conducted semi-structured interviews and used thematic analysis to identify relevant themes.

**Results:** Up to 20 interviews will be completed by August 2016. Emerging themes include the different motivations for participating in PPI, members’ perceptions of the PPI process and how the group influenced research. Members joined to learn more about MND and research. They also wanted to help others by improving awareness of MND and share first hand experiences of the disease. They felt they could provide an independent oversight that not only improved the conduct of research but also promoted public confidence in researchers. Founding members described a sense of ownership of the SMNDRAG group and felt responsible for the group’s future development. These core members were instrumental in improving awareness and recruiting new members and made a substantial contribution to group activities. Members were keen to overcome barriers to involvement in order to widen participation. Some members felt uncertain that their contribution would be useful and some were worried that they lacked sufficient knowledge of science to be useful. Receiving feedback about the impact of their contribution improved members’ confidence in the PPI process. Once members felt part of a research project it encouraged them to become further involved, not only as research subjects but also as collaborators in projects. The nature of MND posed barriers for patients and carers, some of which may be overcome by making the group more flexible and using technology such as video-conferencing.

**Discussion and conclusion:** The results offer an insight into the value of PPI in MND research. We will recommend ways in which these benefits can be harnessed.

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**P319 STIGMA IN PEOPLE WITH MOTOR NEURONE DISEASE/ALS**

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**Keywords:** Stigma, disability, TONiC

**Background:** Illness stigma may increase psychological distress, and decrease self-esteem and self-efficacy. Although stigma has been found to be more severe for people with motor neurone disease (MND/ALS) than other neurological conditions (1), there is no published large scale analysis of stigma in MND/ALS.

**Objective:** To assess the relationships between stigma and demographic or clinical features of MND/ALS in a large population-based sample.

**Method:** The Stigma Scale for Chronic Illness, the Penn State Worry Questionnaire, Rosenberg Self-Esteem Scale and the General Self-Efficacy Scale were administered to patients with MND/ALS as part of the TONiC study, a multicentre, UK study of factors affecting quality of life in MND. The Hospital Anxiety and Depression Scale was also administered. Demographics and disease characteristics, including ALS Functional Rating Scale-revised (ALSFRS-R), were recorded by the clinical team. The results were analyzed using Spearman’s correlations, ANOVA, and multiple regressions.

**Results:** Four hundred and sixty-five records were available for analysis by March 2016. Mean age was 64.9 years, median disease duration was 11 months, 60.6% were male. Stigma was greater in patients with bulbar onset ($F=7.376; p<0.001$) and increased with worse bulbar function (rho=-0.313; $p=0.01$). Stigma was greater in females ($F=4.998; p=0.026$). Stigma was also significantly greater (in ascending order of magnitude) with those who had head drop, drooling of saliva, choking episodes and emotional lability (all $p<0.01$). A multiple linear regression was calculated to predict stigma based on gender, age, duration since diagnosis and ALSFRS bulbar, motor, and respiratory scores. A significant regression equation was found for ALSFRS bulbar and motor scores along with age; ($F (3358) = 32.704, p<0.0001$), with an $R^2$ of 0.215. More disabled and younger people experienced more stigma. Stigma was positively correlated with worry (rho=0.387; $p=0.01$), anxiety (rho=0.360; $p=0.01$) and depression (rho=0.298; $p=0.026$). Stigma is negatively correlated with self-esteem (rho=-0.453; $p=0.01$), and self-efficacy (rho=-0.351; $p=0.01$). A multiple linear regression was calculated to predict stigma based on anxiety, depression, worry, self-esteem, and self-efficacy. A significant regression equation was found for self-esteem, anxiety, and worry ($F (3389) = 48.111, p<0.0001$), with an $R^2$ of 0.271. More anxiety and worry were associated with stigma, whereas good self-esteem may reduce stigma.

**Conclusion:** People with ALS/MND are more likely to experience stigma if disabled, particularly with bulbar features and emotional lability. Stigma is associated with anxiety and worry but may be ameliorated by good self-esteem. The evolution of changes in stigma, mood, and disability are being explored in ongoing longitudinal work, to identify possible therapeutic opportunities.
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**P320 DEPRESSION AND ANXIETY IN PEOPLE WITH MND/ALS**

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Keywords: depression, quality of life, TONiC

**Background:** Psychological factors such as depression and anxiety are very important in motor neurone disease (MND/ALS) because they influence quality of life and survival. Review of the literature suggests that this is the largest cohort to be studied for this purpose to date.

**Objective:** The purpose of this analysis was to examine the prevalence and associated factors of depression and anxiety in MND/ALS patients.

**Methods:** TONiC is an ongoing, longitudinal, multicenter study in the UK which invites people with MND/ALS to complete a questionnaire pack including the Hospital Anxiety and Depression Scale (HADS), scored as probable presence of depression or anxiety, according to previously published modified version of the HADS. Participants also provided data on fatigue, using Neurological Fatigue Index (NFI-MND); quality of life, using the WHO Quality of life scale (WHOQoL-Bref); disability, using ALS Functional Rating Scale-revised (ALSFRS-R); in addition to demographic and clinical characteristics and depression history. All scale scores were converted to interval data by application of the Rasch measurement model and analyses were made by using appropriate parametric tests.

**Results:** Four hundred and fifty-six people with MND/ALS had returned complete HADS questionnaires by March 2016. Their mean age was 64.7 years (SD 10.7) and mean duration of disease was 28.4 months (SD 37.5). The male were 60.6% and 24% were with Bulbar onset. Using the standard cut-offs, 10.8% of participants had probable depression and 13.9% had probable anxiety. Anxiety was greater in females (p=0.009), Bulbar onset MND (p=0.034), and those with increased fatigue (r=0.382, p<0.001). Depression was correlated with fatigue (r=0.443, p<0.001). There was no significant association between depression and age, gender, onset type, or being religious. There was no association between age or employment status and depression or anxiety. Multiple linear regression analysis was performed to predict depression and anxiety. HADS-D was predicted by low physical, psychological, and social (all p<0.01), but not environmental determinants of quality of life. Motor disability did not predict depression, whereas respiratory disability did (p=0.003). Anxiety was only predicted by psychological determinants of quality of life (p<0.001) and motor disability (p<0.001), respiratory disability had borderline significance for the model (p=0.051).

**Conclusion:** Poor quality of life is associated with anxiety and depression in patients with MND/ALS. Anxiety is associated with female gender, fatigue, and motor disability, and may be reduced by strong social relationships. Depression is no different between the sexes and is predicted by respiratory disability rather than physical disability.

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**P321 SYMPTOMS OF PSYCHOLOGICAL TRAUMA RESULTING FROM BEING GIVEN A DIAGNOSIS OF MOTOR NEURONE DISEASE**

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Keywords: PTSD, trauma, diagnosis

**Background:** There is a scarcity of research exploring the psychological trauma resulting from being diagnosed with motor neurone disease (MND). However, symptoms of post-traumatic stress disorder (PTSD) have been well documented in relation to other life-shortening diseases, including cancers (1,2) and multiple sclerosis (3). Such symptoms can adversely affect patient outcomes, even when subsyndromal for a diagnosis of PTSD (4).

**Objectives:** The purpose of this analysis was to examine the prevalence and associated factors of depression and anxiety in MND patients.

**Methods:** Adult patients who were given a diagnosis of MND within the previous one to four months were recruited for the study at the King’s MND Care and Research Centre, King’s College Hospital, London. Participants completed three self-report questionnaires: the PTSD Checklist for DSM-5 (PCL-5), the Generalised Anxiety Disorder 7 Questionnaire (GAD-7), and the Patient Health Questionnaire 9 (PHQ-9), screening for...
PTSD symptoms, anxiety, and depression, respectively. The PCL-5 questionnaire was completed in relation to the stressful life event of being given a diagnosis of MND during a clinic appointment.

**Results:** Eight patients were recruited (aged 52–82 years; 5 female; 7 ALS, 1 PMA). The mean PCL-5 questionnaire score was 9 (range 2–27 points). While no participant reached the PCL-5 cut-off score of 33 indicating probable PTSD, 38% (three individuals) registered scores for at least 8 of the 20 PTSD symptoms being assessed (sample range 2–12 symptoms; mean 5 symptoms). Fifty percent of respondents reported: being troubled by repeated, disturbing, unwanted memories of the clinic appointment in which they were diagnosed; feeling very upset when reminded of that appointment; and trying to avoid external reminders of the appointment. Thirty-eight percent also reported: avoiding memories, thoughts and feelings related to their diagnostic appointment; feeling distant or cut off from others; having trouble experiencing positive feelings; and experiencing irritating behavior or angry outbursts. One individual (13%) scored above the GAD-7 questionnaire cut-off score of 10 points for probable anxiety (sample range 0–13 points; mean 4 points). Half of the PHQ-9 scores indicated probable mild depression (sample range 0–11 points; mean 4 points).

**Conclusions:** Our pilot study suggests that, within the first 1–4 months following diagnosis, subsyndromal PTSD symptoms may approach a similar prevalence to depression and anxiety in MND. With evidence supporting the first possible manifestations of a cognitive dysfunction and the first possible manifestations of a cognitive dysfunction respectively. The PCL-5 questionnaire was completed in relation to the stressful life event of being given a diagnosis of MND during a clinic appointment.

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**P322 DEPRESSION BEFORE THE DIAGNOSIS IN AMYOTROPHIC LATERAL SCLEROSIS PATIENTS WITH COGNITIVE DYSFUNCTIONS: TWO INDEPENDENT EVENTS OR A PREVIEW OF THE SAME?**

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**Keywords:** depression, cognitive dysfunction

**Background:** Because of the strong psychological impact of the disease, depression in patients with Amyotrophic Lateral Sclerosis (ALS) is a common event. In literature, only two recent studies investigate the incidence of depression before the diagnosis of ALS (1,2), with a higher risk of receiving a clinical diagnosis of depression in patients compared to controls.

**Objective:** The aim of our study is to examine the relative risk of depression before diagnosis of ALS in patients with amyotrophic lateral sclerosis (ALS) and cognitive dysfunctions (CD), compared to ALS patients without CD.

**Methods:** We conducted a case-control study including 62 Italian patients with ALS and CD (FrontoTemporal Dementia [ALS-FTD], cognitive disorders [ALS-ci] or behavioral disorders [ALS-bi]) and 62 Italian patients without CD diagnosed from January 2012 to December 2015 presented to our tertiary ALS Centre. In these patients, we analyzed whether they had received a diagnosis of depression (anamnestic criterion or antidepressant in therapy) before the diagnosis of ALS.

**Results:** In our cohort, the incidence of depression before the diagnosis was 20.2% (25/124). Before diagnosis, patients with ALS and cognitive dysfunctions were at higher risk of receiving a clinical diagnosis of depression compared to ALS patients without CD (odds ratio 2.55, 95%CI 1.01–6.46, p=0.048). In ALS-CD patients, the diagnosis of depression was more common in females and in patients with spinal onset. One patient with ALS and CD had a C9orf72 mutation. In patients with cognitive dysfunctions, the percentage of depression in the three subgroups was 47% (8/17) in ALS-FTD, 41.2% (7/17) in ALS-ci, and 11.8% (2/17) in ALS-bi.

**Conclusions:** The incidence of depression in our cohort of ALS patients is higher than the incidence of depression described in the Italian population (3) and in line with the literature in ALS patients (4). Thymic deflection may precede motor alterations and may be a nonmotor prodromal symptom of ALS. It may also be an early manifestation of frontal lobe degeneration and so, an initial cognitive dysfunction may have been mistaken for depression. Our data demonstrate the importance, in ALS patients, to investigate the presence of depressive disorder and the first possible manifestations of a cognitive disorder.

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