Participants and Methods: Participants included two cohorts: older adults with MS recruited from MS centers and patient registries, and healthy controls recruited from the community. A total of 164 adults age 60 and older without dementia were included in the current study, 79 in the MS group (mean age = 65.05 + 4.72; %female = 62) and 85 in the control group (mean age = 69.53 + 6.65; %female = 65.9). All participants were administered a neuropsychological battery including the Hopkins Verbal Learning Test-Revised (HVLT-R). The Patient Determined Disease Steps (PDDS), a patient-rated score of disability severity in MS comprised of eight steps related to walking ability, was used to operationalize MS severity. Using a median split, the PDDS was dichotomized into low (PDDS = 0-2) versus high (PDDS = 3-5) MS severity groups. Linear regression models were run to examine the effect of group (MS vs. control) and disease severity (PDDS) on four operations from the HVLT-R: learning slope, total learning, delayed recall, and recognition. Statistical analyses adjusted for age, years of education, and sex.
Results: Linear regression models revealed that older adults with MS showed lower total learning compared to healthy controls (ß = -.18, p = .03). Learning slope, delayed recall, and recognition did not differ by group (p > .05). Compared to healthy controls, older adults with high MS severity performed worse on total learning (ß = -.21; p = .01) and delayed recall (ß = -.18; p = .03). Group differences on learning slope and recognition were not significant (p > .05).
Conclusions: The presence of MS was associated with worse total learning. Moreover, high severity of MS was associated with worse total learning and delayed recall in older adults. These results delineate the influence of MS on specific memory operations and emphasize the potential utility of disease severity on cognitive performance in aging.

Categories: Multiple Sclerosis/ALS/Demyelinating Disorders
Keyword 1: multiple sclerosis
Keyword 2: memory disorders
Keyword 3: aging disorders
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33 Amyotrophic Lateral Sclerosis with and without Bulbar Onset: Cognitive and Behavioral Findings from an Outpatient Sample

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Objective: The relationship between frontotemporal dementias (FTDs) and amyotrophic lateral sclerosis (ALS) is well established and is believed to be more pronounced in those with bulbar onset ALS (B-ALS). This study compared cognitive and behavioral symptoms among persons with B-ALS to those of individuals with nonbulbar phenotypes (NB-ALS).
Participants and Methods: Outpatient clinic data collected during an initial neuropsychology consultation at an ALS interdisciplinary clinic in an academic medical center was retroactively analyzed. All individuals were diagnosed with ALS by neurologists specializing in movement and neuromuscular disorders based on results of neurological/motor examination, electromyographies, and (when available) genotypic data. Total scores on the short form of the Montreal Cognitive Assessment (MoCA-SF) and scores on the ALS Cognitive Behavioral Screen (ALS-CBS) and ALS CBS Caregiver questionnaire were of focus. 22 B-ALS and 44 NB-ALS individuals were compared on said measures using univariate analyses while controlling for ALS symptoms duration.
Results: B-ALS individuals scored significantly lower on the MoCA-SF ($F(2)=3.15$, $p=0.05$, $\eta2=0.13$) and the tracking subscale of the ALS-CBS ($F(2)=3.50$, $p=0.04$, $\eta2=0.17$). The groups were not significantly different on other ALS-CBS measures, including caregiver-rated behavior questionnaire.
Conclusions: Consistent with previous research, this study found lower total scores on a brief screener of global cognition and tasks of tracking requiring cognitive control in those with B-ALS relative to NB-ALS individuals. Interestingly, despite behavioral variant being the most prevalent FTD phenotype, the groups did not differ significantly in terms of caregiver-rated behavioral changes. It is hypothesized that the absence of these differences could reflect effects of gradual loss of speech and functionality that secondarily limit caregivers' abilities to observe behavioral changes

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concerning for possible behavioral variant FTD. That said this could reflect limitations of the sample and/or study design, and further exploration is therefore needed. Recommendations for future studies of neuropsychological/behavioral variables in B-ALS as well as development of more targeted instruments for use in this population are discussed.

Categories: Multiple Sclerosis/ALS/Demyelinating Disorders
Keyword 1: amyotrophic lateral sclerosis
Keyword 2: dementia - other cortical
Keyword 3: academic achievement
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34 Verbal Memory as a Language Function: Phonological Processing Contributes to Word List Recall in Persons with Multiple Sclerosis

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Objective: Verbal memory deficits are present in multiple sclerosis (MS), but neither inflammatory T2 lesion volume nor cerebral atrophy (generalized or localized hippocampal atrophy) fully explain disease-related verbal memory changes. Importantly, the hippocampus does not function in a vacuum; memory encoding and retrieval requires interactions between the hippocampus and cortical areas where information is processed and represented. Indeed, we have previously shown that lexical access speed (a language function assessed by rapid automatized naming) independently predicted delayed recall of verbal information (word list) for persons with MS, even when controlling for total learning. Informed by this work and recent ultra high field (7.0 Tesla) MRI research reporting high cortical lesion count in regions associated with phonological processing (e.g., plenum temporale, superior temporal gyrus), we assessed whether phonological processing independently explains verbal memory deficits in persons with MS.
Participants and Methods: Analyses were performed on a clinical sample of persons with MS aged 18 to 59 years (n=60: 49 relapsing, 11 progressive). Word-list memory was assessed by the Hopkins Verbal Learning Test, Revised (HVLT-R), which yielded scores for Total Learning (TL) and Delayed Recall (DR). Phonological processing was assessed with WIAT-4 Phonemic Proficiency. WIAT-4 Sentence Repetition was utilized as a non-phonological language control task, and WIAT-4 Word Reading was administered to control for premorbid verbal ability. CANTAB Paired Associate Learning served as a nonverbal memory comparison. Performance on tasks was standardized using published age-adjusted norms. Primary analyses used partial correlations to assess relationships between Phonemic Proficiency and (a) HVLT-R TL and DR controlling for WIAT-4 Word Reading, and (b) HVLT-R DR controlling for WIAT-4 Word Reading and HVLT-R TL. To assess specificity to phonological processing, the same partial correlations assessed relationships between Sentence Repetition and HVLT-R variables, and between Phonemic Proficiency and nonverbal memory (CANTAB PAL).
Results: When controlling for premorbid verbal ability, Phonemic Proficiency performance accounted for 7.8% of the variance in HVLT-R TL ($r_{partial}$=0.28, p=0.031) and 16% of the variance in HVLT-R DR ($r_{partial}$=0.40, p=0.002). Moreover, when additionally controlling for HVLT-R TL, Phonemic Proficiency still accounted for 10% of the variance in HVLT-R DR ($r_{partial}$=0.32, p=0.016). Showing specificity to phonological processing ability, performance on Sentence Repetition was not significantly related to HVLT-R DR when controlling for premorbid verbal ability (WIAT-4 Word Reading) and HVLT-R TL ($r_{partial}$=0.09, p=0.510). Showing specificity to verbal memory, neither Phonemic Proficiency nor Sentence Repetition performance were reliably related to CANTAB PAL for any variance in performance in nonverbal memory (Ps>0.9).
Conclusions: Results suggest that language ability, specifically phonological processing, contributes to delayed recall of word lists independent of premorbid verbal ability and initial total learning scores in persons with MS. These findings demonstrate contributions of language ability to verbal memory and highlight the need for further research into language ability changes in persons with MS. This may have implications for verbal memory rehabilitation in MS.

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