Cognitive impairment diagnosis

- Diagnostic dynamic contrast-enhanced magnetic resonance imaging blood-brain barrier assessment combined with plasma biomarkers for mild cognitive impairment
- Beyond "Worried Well": Healthcare Professionals' Perspectives on Improving Subjective Cognitive Decline Care
- LCN2 of cerebrospinal fluid: A potential biomarker for diagnosis and disease progression in Alzheimer's disease
- Utility of machine learning algorithms in classification of progressive cognitive impairment in Alzheimer's disease: A retrospective cohort based on China
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- Systematic Assessment of Dysexecutive Syndrome, Hypersomnolence and Dysautonomia in Kleine-Levin Syndrome
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Diagnosing cognitive impairment involves a comprehensive evaluation conducted by healthcare professionals, typically specialists such as neurologists, geriatricians, or neuropsychologists. The diagnostic process aims to assess an individual's cognitive abilities and determine the presence and severity of any cognitive impairment. Here are the key steps involved in diagnosing cognitive impairment:

Medical History and Physical Examination: The healthcare professional will begin by taking a detailed medical history, including information about the individual's symptoms, their onset, duration, and progression. They will also inquire about medical conditions, medications, and any relevant family history. A thorough physical examination may be conducted to identify any underlying medical conditions that could contribute to cognitive impairment.

Cognitive Screening: The healthcare professional may administer a brief cognitive screening test, such as the Mini-Mental State Examination (MMSE) or the Montreal Cognitive Assessment (MoCA). These tests provide an initial snapshot of an individual's cognitive functioning and help identify potential areas of concern.

Neuropsychological Testing: If cognitive impairment is suspected, more in-depth neuropsychological testing may be conducted. This involves a series of standardized tests and assessments that evaluate various cognitive domains, including memory, attention, language, visuospatial abilities, and executive function. Neuropsychological testing provides a detailed profile of an individual's cognitive strengths and weaknesses.

Medical Imaging: Brain imaging techniques, such as magnetic resonance imaging (MRI) or computed tomography (CT) scans, may be recommended to detect any structural abnormalities or brain changes that could be contributing to cognitive impairment. These scans can help rule out other potential causes, such as tumors, strokes, or brain lesions.

Laboratory Tests: Blood tests may be conducted to assess the individual's overall health and to identify any underlying medical conditions or deficiencies that could affect cognitive function. These

tests may include a complete blood count (CBC), thyroid function tests, vitamin B12 levels, and tests for infections or inflammatory markers.

Diagnostic Criteria and Evaluation: The healthcare professional will compare the individual's cognitive test results, medical history, physical examination findings, and imaging results with established diagnostic criteria for various cognitive disorders, such as Alzheimer's disease, vascular dementia, Lewy body dementia, or other causes of cognitive impairment. These criteria, such as those outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5), help guide the diagnosis.

Follow-up and Monitoring: In some cases, additional follow-up assessments may be required to track changes in cognitive function over time. This can help determine the progression of cognitive impairment and guide appropriate management and treatment strategies.

It's important to note that diagnosing cognitive impairment can be complex, and the process may vary based on individual circumstances. A comprehensive evaluation by healthcare professionals with expertise in cognitive disorders is crucial to obtain an accurate diagnosis and develop an appropriate treatment and management plan.

Computer-aided detection, used in the screening and diagnosing of cognitive impairment, provides an objective, valid, and convenient assessment. Digital sensor technology is a promising detection method.

A study aimed to develop and validate a novel Trail Making Test (TMT) using a combination of paper and electronic devices.

This study included community-dwelling older adult individuals (n=297), who were classified into (1) cognitively healthy controls (HC; n=100 participants), (2) participants diagnosed with mild cognitive impairment (MCI; n=98 participants), and (3) participants with Alzheimer disease (AD; n=99 participants). An electromagnetic tablet was used to record each participant's hand-drawn stroke. A sheet of A4 paper was placed on top of the tablet to maintain the traditional interaction style for participants who were not familiar or comfortable with electronic devices (such as touchscreens). In this way, all participants were instructed to perform the TMT-square and circle. Furthermore, we developed an efficient and interpretable cognitive impairment-screening model to automatically analyze cognitive impairment levels dependent on demographic characteristics and time-, pressure-, jerk-, and template-related features. Among these features, novel template-based features were based on a vector quantization algorithm. First, the model identified a candidate trajectory as the standard answer (template) from the HC group. The distance between the recorded trajectories and reference was computed as an important evaluation index. To verify the effectiveness of our method, we compared the performance of a well-trained machine-learning model using the extracted evaluation index with conventional demographic characteristics and time-related features. The well-trained model was validated using follow-up data (HC group: n=38; MCI group: n=32; and AD group: n=22).

They compared 5 candidate machine learning methods and selected random forest as the ideal model with the best performance (accuracy: 0.726 for HC vs MCI, 0.929 for HC vs AD, and 0.815 for AD vs MCI). Meanwhile, the well-trained classifier achieved better performance than the conventional assessment method, with high stability and accuracy of the follow-up data.

The study demonstrated that a model combining both paper and electronic TMTs increases the accuracy of evaluating participants' cognitive impairment compared to conventional paper-based

feature assessment [1)].

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Zhang W, Zheng X, Tang Z, Wang H, Li R, Xie Z, Yan J, Zhang X, Yu Q, Wang F, Li Y. Combination of Paper and Electronic Trail Making Tests for Automatic Analysis of Cognitive Impairment: Development and Validation Study. J Med Internet Res. 2023 Jun 9;25:e42637. doi: 10.2196/42637. PMID: 37294606.