Computer-based assessment of memory and attention in patients with Alzheimer’s dementia

G. Adler1,2, M. Bektas1, N. Baumgart2, M. Feger1, Y. Lembach1
1Institut für Studien zur Psychischen Gesundheit, Mannheim, 2Dynamikos GmbH, Mannheim

Introduction

Computer-based methods may have advantages for the neuro-psychological assessment of mild to moderate dementia. However, in this field, such methods are not yet established. We developed a computer-based assessment tool for the diagnostics of dementia, the Memory and Attention Test (MAT). It is suited for the assessment of elderly persons, in whom slight psychomotor retardation or mild visual or auditory impairments are frequent. Additionally, it accounts for little experience in the handling of electronic equipments or computers and feels of insecurity or timidity in the testing situation. Relevant cognitive domains for the diagnostics of dementia, particularly working and short-term memory for verbal, figural and episodic material and selective attention are assessed without extensiv usage of praxia, motor or executive functions.

The Memory and Attention Test (MAT)

The MAT allows the diferentiated and standardized assessment of seven cognitive domains: - working memory for verbal, figural and episodic material - short-term memory for verbal, figural and episodic material - selective attention

The test adapts to the individual level of performance of the subjects. Thus, subjects with a poor performance don’t end frustrated through a large number of tasks they cannot master.

Methods

The assessments were carried out in 42 patients (14 men, 28 women) at ages from 60 to 84 years suffering from probable Alzheimer’s dementia (NINDC-ADRDA criteria, MMS score: 15-26) and in 42 age-, sex- and education-matched controls. The mean age of the patients was 71.2 (SD: 7.2) years. They had a mean of 12.8 years of education. The MMS score was 20.3 (SD: 3.6) in the patients and 28.6 (SD: 1.3) in the controls.

In all subjects, we first performed the MMS test, the Auditory Verbal Learning Task (AVLT), the immediate and delayed reproduction of the Rey-Osterrieth Complex Figure (ROCF), the subtest „Logical Memory“ of the Wechsler Memory Scale (LM-WMS) and an attention test validated in older subjects, the Alters-Konzentrations-Test (AKT). After a break of one to three days later, the patients were assessed by means of the Memory and Attention Test (MAT). In a subgroup of 19 patients and 12 controls, a second MAT assessment was carried out 14 to 21 days after the first assessment. In the patients assessed twice, we additionally studied their acceptance for the assessment and their experience with technical devices by means of standardized questionnaires.

Results

Validity and reliability

For the assessment of validity of the MAT subtests, we studied their correlations with the respective reference methods. The results are given in table 1. The retest reliability was calculated in the subgroup of 31 subjects, who were studied twice. The correlations were for memory 0.895 (p<0.01) and for attention 0.787 (p<0.01).

Differentiation of patients and controls

Group differences between Alzheimer patients and controls are given in table 2.

By means of a stepwise logistic regression analysis, we found three parameters to be independent predictors of the dependent variable „patient status“. The variable “episodic short-term memory” allowed as a single variable the best discrimination of patients and controls, with a sensitivity of 0.62 and a specificity of 0.57. In a ROC analysis for the sum score of episodic short-term memory, visual short-term memory and attention, the AUC was 0.81.

Subjective evaluation by the probands

The subjective evaluation of the computer-based testing by the probands was very positive (table 3). Nearly all of them said they could see and hear everything well and had no difficulties in the handling of the computer. A slight majority found it even more pleasant to be tested by a computer than by a person.

Conclusion

The computer-based assessment of memory and attention is surprisingly well accepted by Alzheimer patients and other elderly subjects. The newly developed Memory and Attention Test (MAT) allows a selective and adaptive assessment of selective attention, working and short-term memory, which meets the validity and reliability criteria for psychometric tests.

Contact: Prof. Dr. Georg Adler: adler@ispg-mannheim.de