Cognitive assessment is of growing importance, with the general population getting older and a rapidly growing incidence of dementia, which is a major public health issue. Treatment of dementia must, to be most effective, start early in the disease process. Thus, early detection of cognitive decline is important. Cognitive decline may be detected using fully automated computerized assessment. Such systems will provide inexpensive and widely available screenings of cognitive ability. The aim of this pilot study is to develop a real time steady state visual evoked potential (SSVEP) based brain-computer interface (BCI) for neurological cognitive assessment. It is intended for use by patients who suffer from diseases impairing their motor skills, but are still able to control their gaze. Results are based on 11 healthy test subjects. The system performance have an average accuracy of 100% ± 0%. The test subjects achieved an information transfer rate (ITR) of 14.64 bits/min ± 7.63 bits=min and a subject test performance of 47.22% ± 34.10%. This study suggests that BCI may be applicable in practice as a computerized cognitive assessment tool. However, many improvements are required for the system to be fully valid and of clinical use.