Introduction

• Meanwhile, dysfunctions of attention, memory, problem solving and visual-motor planning are considered as key symptoms in many mental diseases. These deficits tend to persist even after conventional treatment and lead to social and vocational functioning [1,2,3].

• Hence patients should receive cognitive training to influence their further course of illness positively. Meanwhile, a substantial number of studies have demonstrated that computer-aided training can improve patients’ performance in attention, memory, visual-motor and executive tasks [4-8]. The use of computers has several advantages: Firstly, complex tasks can be repetitively adapted according to the individual state of skills of the trainees. Furthermore, the usage of computers in cognitive training has proved to be more motivating than other training methods.

• Because of these findings it was claimed that schizophrenic patients should receive cognitive training in order to influence their course of illness more positively.

• However, controlled efficacy studies of cognitive training in patients suffering from schizophrenia yield inconsistent results. While some authors are reporting significant effects mainly on working memory and executive function, minor or no effects are reported by other studies.

• Several candidate moderating variables may explain inhomogeneity of these findings: Beside the extent of cognitive training received by the patients, they seem to profit even more from healthy patients from the use of reinforcing feedback and teaching of strategies. Furthermore, motivating tasks that compensate for motivational deficits and avoid negative feedback could be helpful to overcome avolition. A training of errorless learning using gradually increasing levels of difficulty should be used instead [9,11].

Methods

• 40 outpatients of the psychiatric hospital in Regensburg, Germany, and 60 inpatients from the psychiatric hospital in Bamberg, Germany were included [12,13]. All of them fulfilled DSM-IV criteria for schizophrenia.

• In both samples using completely different training settings, positive effects of enjoyable computer-aided cognitive training were observed. The outpatient study’s EG received two sessions of cognitive training a week for a duration of 10 weeks using the cognitive training software X-Cog®.

• Inpatient study’s EG received four sessions of cognitive training a week for a duration of 3 weeks using the cognitive training software X-Cog®.

• In the current version 2.6 X-Cog® contains 19 visuomotor, memory, executive and attention tasks, that were explicitly designed to motivate the patients as much as possible, while “playing” the exercises.

• The experimental group (EG) contained 20 (average age 33.2 years) and 30 (average age 36.9 years) patients matched for gender, age and educational level formed the control group (CG).

• Outpatient study’s EG received two sessions of cognitive training a week for a duration of 10 weeks using the cognitive training software X-Cog®.

• Inpatient study’s EG received four sessions of cognitive training a week for a duration of 2 weeks using the cognitive training software X-Cog®.

• In the current version 2.6 X-Cog® contains 19 visuomotor, memory, executive and attention tasks, that were explicitly designed to motivate the patients as much as possible, while “playing” the exercises.

• Control groups received no training but other standard therapeutic treatment (mainly occupational therapy).

• Cognitive functioning was measured by the Wisconsin Card Sorting Test (WCST), the German Version of the California verbal Learning Test (VLT, outpatient study only), subtests of the Wechsler Memory Scale (WMS, inpatient study only), subtests of the “Testbatterie zur Aufmerksamkeitsprüfung” (TAP outpatient study only), a German computer test for several subtypes of attention and the Continuous Performance Test (CPT, inpatient study only). Symptom levels for all patients were rated by PANSS (outpatient study only), SAPS and SANS (both inpatient study only).

• Multivariate MANOVAs (dependent variables: cognitive measures; between subject factor: Time of testing [baseline vs. posttest]) were performed in both samples to test for effects of cognitive training. A significant interaction effect (time*group) was expected because this would indicate a training effect for the EG compared to the CG.

• For all participants of the inpatient studies, time and number of rehospitalisations (if any) could be traced for a period of three years.

• Cox regression survival analyses were performed to figure out what factors may influence time until patients’ next hospitalisation. Information about the patient’s circumstances (marital-status, educational level, employment status, time since onset of illness and hallucination status), gender, cognitive achievement level and symptom level at posttest were introduced as independent variables in a stepwise procedure.

Conclusions

• In both samples using completely different training settings, positive effects of enjoyable computer-aided cognitive training on cognitive achievement could be found.

• For the outpatient sample, verbal memory achievement and employment status best predicted the further course of illness (measured as days until rehospitalisation) in a three years follow-up period (see 12 for similar results). Verbal memory level, on the other hand, seems to be influenced by baseline memory scores and cognitive training only. Improving patient’s cognitive functioning may therefore be helpful to positively influence patient’s further course of illness.

Results

• MANOVA results are shown below, significant interaction effects marked by asterisks. Significant interaction effects are found for all cognitive measures of both studies, mainly due to an increase of cognitive achievement in the EG compared to rather unchanged performance in CG, excluding verbal memory in the outpatient study, where achievement is worse in CG at posttest compared to baseline while in EG performance remains unchanged from baseline to posttest.

• The stepwise procedure in the Cox Regression analysis stopped when two variables – employment status and verbal memory score at posttest – were included in the equation. Results are shown below, including separate Kaplan Meier survival tables for both variables.

• In order to screen, which variables influence the only cognitive variable that is correlated with rehospitalisation rates, a stepwise linear regression analysis was performed using verbal memory as dependent variable. All cognitive and symptom measures at baseline, “treatment” (CG vs. EG) as well as marital status, educational level, employment status, hallucination status, time since onset of illness and gender were included as independent variables. Only verbal and visual memory at baseline and “treatment” remained in the equation. The results are displayed in the table below. The figure on the left finally summarizes the results of linear and Cox regression.

References

- O’Carrol R.E., Russell H.H., Lawrie S.M., Johnstone E.C. (1999) Cognitive Improvement of Schizophrenia Patients: Enhancing Cognition while Enjoying Computer-Aided Cognitive Training, 2nd Conference of the European Society for Cognitive Research and Remediation, Regensburg, Germany; University School of Medicine, for Psychiatry, Germany; University School of Medicine, Bamberg, Germany; University School of Medicine, Germany; University School of Medicine, Germany; University School of Medicine, Germany. A thesis presented in Partial Fulfillment of the Requirements for the Degree of Doctor of Philosophy in Clinical Psychology.