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Cognitive remediation in schizophrenia: Inpatients, outpatients and long-term course of illness

SOZIALSTIFTUNG BAMBERG
TREATMENT. WELLNESS. CARE.

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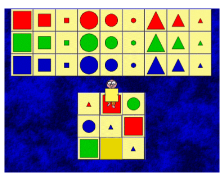
Introduction

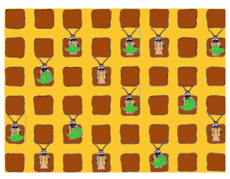
- Meanwhile, dysfunctions of attention, memory, problem solving and visual-motor planning are considered as key symptoms in many mental diseases. These deficits tend to persist even after conventional treatment and limit social and vocational functioning [1-3].
- Hence patients should receive cognitive training to influence the further course of their illness positively. Meanwhile, a substantive number of studies have demonstrated that especially 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 to influence their further course of illness positively.
- However, controlled efficiacy 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 inhomogenity of these findings: Beside the extent of cognitive training received by the patients, they seem to profit even more than 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

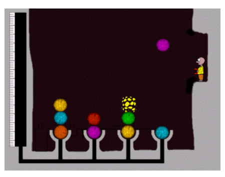
- 40 outpatients of the psychiatric hospital in Regensburg, Germany, and 60 inpatients from the psychiatric hospital in Bamberg, Germany were included [12,13]. All of them fulfilled ICD-10 as well as DSM- IV criteria for schizophrenia.
- 20 (5 f., 15 m., average age 30.8 yrs) / 30 (15 f., 15 m., average age 36.4 yrs) patients were selected to the experimental group (EG), 20 (average age 33.2 years) / 30 (average age 36.9 years) patients matched by 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 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. Below, exemplary screenshots and task descriptions are shown.
- 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 (MVGT, 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).
- The cognitive and psychopathology measures described above were obtained before the first and after the last training session. Patients of the control group were tested with an interval of ten / three weeks.
- Multivariate MANOVAs (dependent variables: cognitive measures; between subject factor: Time of testing [pre- 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 inpatients study, 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 habitation status), gender, cognitive achievement level and symptom level at posttest were introduced as independent variables in a stepwise procedure.



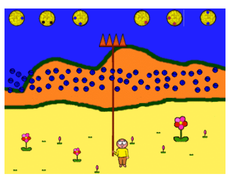
Magic carpet: *8 tiles are positioned in a 3*3 square matrix. The missing tile has to be completed following the implicit logical rules for color, shape and size.*



salad clash: *Hungry snails dig themselves into salad beds. The players have to remember where the snails are hidden, when they saw salad*



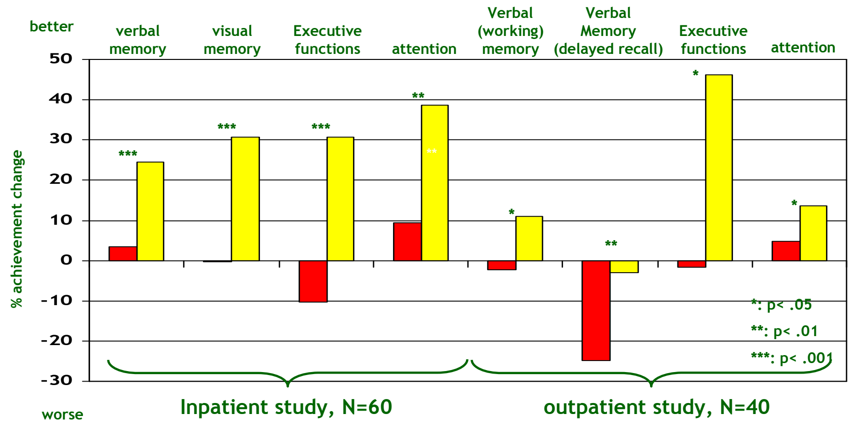
Fruit press: *To create pink fruit juice, falling comets have to be sorted in dishes. Special comets can't be sorted and have to be destroyed while falling*



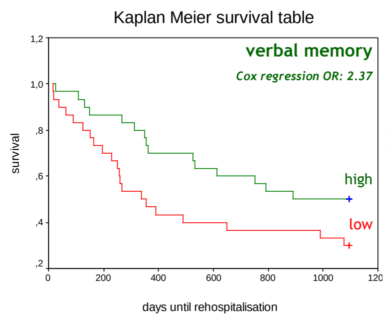
Rainmaker: *To pour a flower field a comet-fork has to stabbed into passing comets. But only distinct comets contain water.*

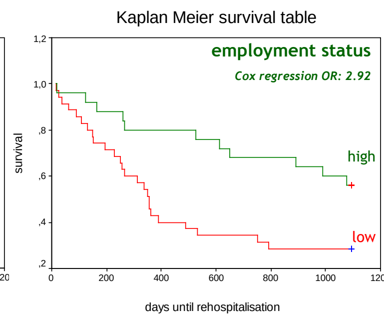
Results

- 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.



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-2 Log Likelihood     255,241

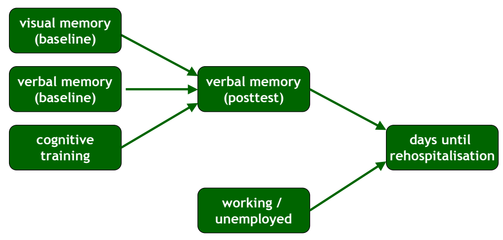
                     Chi-Square    df    Sig
Overall (score)          12,226     2  ,0022
Change (-2LL) from
 Previous Block          12,500     2  ,0019
 Previous Step            6,215     1  ,0127

--------- Variables in the Equation --------------------

Variable          B    Wald    df    Sig       R      Exp(B)

EMPLOYMENT   1,0713  8,1319    1   ,0043   ,1513    2,9191
VERBALMEMORY -,8622  6,1018    1   ,0135  -,1238     ,4222
```

- 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" (EG vs. CG) as well as marital-status, educational level, employment status, habitation 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.



stepwise linear regression, dependent variable: verbal memory posttest

	model	unstandardized coefficients B	unstandardized coefficients Standard error	standardized coefficients Beta	T	p	R^2
1	(constant)	37,274	7,439		,000	5,011	,527
	verbal memory baseline	,692	,086	,726	,000	8,032	
2	(constant)	61,845	7,303		,000	8,469	,702
	verbal memory baseline	,704	,069	,738	,000	10,203	
	group(EG vs. CG)	-17,011	2,932	-,419	,000	-5,802	
3	(constant)	48,881	8,307		,000	5,884	,739
	verbal memory baseline	,581	,078	,609	,000	7,409	
	group (EG vs. CG)	-18,917	2,852	-,466	,000	-6,632	
	visual memory baseline	,324	,116	,236	,007	2,802	

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 14 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.

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