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Study of Cognitive Functions Efficaciously Affected by Psychoeducational Program for Patients with Schizophrenia

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Abstract

Background: Although psychoeducational programs for patients with schizophrenia have become relatively standardized, the correlation between effectiveness of such programs and cognitive function has rarely been investigated. To the best of our knowledge, studies detailing the effectiveness of such programs on cognitive function in Japan have yet to be reported.

Method: Participants included 91 patients with schizophrenia (women, n=46; men, n=45; mean age, 43.2 years) who had been admitted to a subacute care unit in Showa University Karasuyama Hospital and who had given their consent to participate. In this study, a new psychoeducation-based, psychosocial intervention program (the Program) was initiated. The effectiveness of the Program was evaluated by the comparisons with global daily function and daily cognitive functions between pre and post intervention in patients.

Results and discussion: Our results showed that the global assessment of functioning (GAF) score was significantly associated with the Wisconsin card sorting test (WCST) total number of errors and perseverative errors. We confirmed that the effectiveness of the Program and global functional improvement is related with improvement of executive function.

Conclusion: On the basis of these results, future studies are warranted to improve our program and confirm its long-term effectiveness.

Keywords: Neuropsychological tests, Schizophrenia; Psychoeducational programs; Cognitive function

Introduction

In Japan, in the inpatient psychiatric treatment, acute phase of has been promoted. As a result, the number of specialized hospital wards for psychiatric emergencies is increasing, and hospital stays are becoming shorter. Because schizophrenia is chronic illness and only pharmacotherapy is not sufficient to achieve remission, psychoeducation, which is one of non-pharmacotherapies is also focused on. In fact, for schizophrenia, psychoeducation is becoming the standard, and numerous studies have examined its effects [1-5]. However, psychoeducation has been widely practiced as a psychosocial treatment of schizophrenia [6]. Therefore, we examined the effect of our originally constructed program by some of the indicators [7,8]. Also, the shorten hospital stay is not favorable to achieve remission, making it increasingly difficult to provide sufficient psychosocial treatment during a patient's hospital stay. Clearly, the need exists for a short-term, intensive treatment program that can be initiated and conducted shortly after hospital admission.

In recent years, attention has also been given to a treatment method that focuses on cognitive function in schizophrenia [9,10]. Compared with healthy individuals, individuals with schizophrenia experience impaired cognitive functioning. In particular, marked impairments are observed in verbal learning, executive function, speed of motion, and verbal fluency [11], and it has frequently been reported that such cognitive impairments interfere with the social lives of affected individuals [12-14]. Studies showing the ameliorating effects of atypical antipsychotic drugs on neurocognitive function have become very popular [2,15-17]. However, the effectiveness of rehabilitation acting on these cognitive functions is being considered. Rehabilitation aimed at improving cognitive function is currently garnering attention as one part of psychosocial treatment, and various integrated rehabilitation programs, such as integrated psychological treatment (IPT) that combines cognitive rehabilitation with social skills training (SST) or cognitive enhancement therapy (CET) that combines SST with social cognition, show promise for improving overall abilities [18]. Also, although it has been pointed out that the cognitive impairment can hinder psychosocial intervention [19,20], the relationship between intervention effects and cognitive function is not clearly understood. As for our study hypothesis, the severity of the prior cognitive function has an influence on the effect of the psychoeducation.

Therefore, the purposes of the study were to measure the effects of our treatment program (the "Program") which is on the basis of

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multidisciplinary psychoeducational intervention, on daily function in patients with schizophrenia. And to evaluate which cognitive functions are related with the efficacy of the Program on remission. Therefore, we checked the degree of the cognitive function in the group which carried out psychoeducation and the group which did not carry it out.

Subjects and Methods

Subjects

Candidate participants were all inpatients in subacute ward in Showa University Karasuyama Hospital, Tokyo, Japan. Participants were chosen from a group of patients who had been diagnosed with schizophrenia (international Classification of Diseases-10; ICD-10 F20.0) 21) and who had enrolled in a new psychoeducation-based, psychosocial intervention program (the Program) from February 2010 to December 2012. Of the candidate patients, 91 completed all eight courses of the Program, which is explained below and all these patients were agreed to participate in this study. Baseline characteristics of the participants are shown in Table 1.

Study methods

Overview of the Program: The Program, which aims to enable stable community living without recurrence, was designed to encourage patients with Schizophrenia to voluntarily participate in treatment. Candidates included patients who were admitted to the subacute ward in our hospital from super emergency ward and were agreed with participate the Program. Patients who were received the short-term treatment at the super emergency ward, however, those were insufficient for hospital discharge, were transferred to o the subacute ward, where the aim of treatment goal is to achieve sufficient remission within 3-6 months of ongoing treatment (the Program).

		Mean ± SD
No. of subjects	**Range**	91
Gender (male/female)		45 (49.5%)/46 (50.5%)
Age (years)		43.2 ± 12.0
No. hospital stays(day)		3.9 ± 4.5
Length of hospital stay (day)		220.1 ± 118.9
PANSS positive scale score	7-49	22.5 ± 5.9
PANSS negative scale score	7-49	24.5 ± 6.4
PANSS total pathology score	16-112	45.3 ± 11.4
PANSS total score	30-210	87.8 ± 25.9
JART score		98.7 ± 12.2
* The Positive and Negative Syndrome Scale (PANSS); * Japanese Adult Reading Test (JART)		

Table 1: Overview of participants.

Range	Range	Range
1	What type of disease is schizophrenia?	Doctor
2	Ensuring you don't forget your medications	Pharmacist
3	Ensuring a well-balanced diet	Registered dietitian
4	Improving communication skills (SST)	Clinical psychologist
5	How to achieve a stable lifestyle	Nurse
6	Social resources you can use in community life	Psychiatric social worker
7	Tour of the day-care service and occupational therapy: Message from a veteran	Occupational therapist
8	Summary	All types
* Social Skills Training (SST)		

Table 2: Treatment program based on multidisciplinary psychoeducation intervention.

The originally constructed program [7,8] is composed of eight lessons (length of the program: approximately 8 weeks) and is based on multidisciplinary, psychoeducational intervention that includes social skills training (SST) (which was created in an effort to collaborate with community organizations), roll playing, inter-patient discussions, day care center trials, and other activities. Each hour-long psychoeducation lesson includes a 30 min lecture and 30 min group discussion and takes place once a week in the ward hall. The Program is administered by the following seven professionals: a doctor, nurse, pharmacist, clinical psychologist, psychiatric social worker, occupational therapist, and registered dietitian. Each professional took charge of his or her respective lesson with the common goal of making the patient capable of living independently after hospital discharge.

At each lecture, each professional provided information (maintaining a certain degree of quality); the professional then led the group discussion, which was aimed at assisting in independent understanding of the information provided and instigating mutual interaction among patients. To ensure these discussions proceeded smoothly, other staff members also listened (along with patients) to the lectures and participated in the discussions. These enabled various techniques to be applied in the program-making procedure (Table 2) [7,8].

Indicators: The Positive and negative syndrome scale (PANSS) [22] was used to measure participants' clinical attributes. The Japanese adult reading test (JART) [23] was used to measure intellectual function. Information, such as baseline characteristics, number of days admitted to the hospital, and number of hospital stays was taken from medical records. Antipsychotic drug use was calculated as the equivalent dose of chlorpromazine (CP) from a dose equivalence table [24].

Main measurement indicators for the Program ("efficacy indicators"), which were administered by the primary physician, included the global assessment of functioning (GAF) [25] and the schedule for assessment of insight (SAI-J) [26]. The remaining efficacy indicators, which were self-administered, included the drug attitude inventory (DAI-10) [27], general self-efficacy scale (GSES) [28], and the Japanese version of the Schizophrenia Cognition Rating Scale (SCoRS-J) [29]. As for cognitive functions the following tests were included in this series: the Japanese verbal learning test (JVLT) [30] and the story memory subscale of the Wechsler memory scale (WMS-R) to measure verbal memory, the digit span subscale of the WMS-R and the trail making test B (TMT-B) [31] to measure working memory, the trail making test A (TMT-A) [31] to measure processing speed, the verbal fluency task (VFT) [32] and a computer-based version of the Wisconsin card sorting test (WCST; Phatima: http://www.phatima.co.jp/products/wcst.html) to measure executive function, and the Continuous Performance Test (CPT) to measure attention.

As for PANSS, SCoRs, TMT, the thing except CPT, the one that is high in numerical value has good function.

Statistical analysis: Univariate analysis using paired t-tests and Wilcoxon's signed rank sum test was performed on measurements of the efficacy indicators before and after the Program. Next, to test for the effects of cognitive function on Program efficacy, participants were

				Mean ± SD		
	Range	**Pre-intervention**	**Post-intervention**	**P value**	**t value**	**d value**
CP equivalent dose (n=90)	0-Limit value	1001.3 ± 505.3	971.8 ± 516.3	0.408	0.574	0.04
GAF (n=75)	0-100	49.5 ± 12.0	58.1 ± 10.1	<0.001	-7.978	0.73
SAI-J (n=73)	0-18	12.1 ± 4.6	15.5 ± 3.3	<0.001	-7.26	0.78
DAI-10 (n=77)	(-10) - (+10)	3.7 ± 6.7	6.0 ± 8.3	<0.001	-4.385	0.28
GSES (n=74)	21-80	44.4 ± 11.2	45.0 ± 12.3	0.555	2.185	0.2
SCoRS-J (n=75)	20-80	42.9 ± 13.6	41.3 ± 13.3	0.117	1.367	0.1
* Chlorpromazine (CP); * Global Assessment of Functioning (GAF); * Schedule for Assessment of Insight (SAI-J);						
* Drug Attitude Inventory (DAI-10); * General Self-Efficacy Scale (GSES); * Schizophrenia Cognition Rating Scale (SCoRS-J)						

Table 3: Measurement of intervention efficacy by comparison of before and after the program.

						Mean ± SD
				GAF		
	Name of test	**Indicators**	**Range**	**Improvement group**	**Non-improvement group**	***P* value**
				n=60	n=14	
Gender (male/female)				31/29	07-Jul	1
Age				42.0 ± 11.7	48.9 ± 11.8	0.061
Psychiatric symptoms	PANSS	Total score	30-210	90.0 ± 21.3	87.1 ± 23.0	0.654
Negative symptoms	PANSS	Negative scale score	7-49	24.4 ± 5.6	23.2 ± 8.5	0.639
Dose	CP equiv. dose		0-Limit value	859.8 ± 437.2	810.0 ± 369.4	0.762
Intelligence index	JART	No. responses		98.9 ± 11.5	98.6 ± 16.3	0.611
Memory	JVLT	No. recalls	0-48	21.5 ± 7.3	20.4 ± 3.5	0.453
		SCR	0-36	5.1 ± 4.0	4.1 ± 2.8	0.183
	JVLT (delays)	No. recalls	0-48	6.9 ± 3.5	5.9 ± 2.3	0.102
		SCR	0-36	2.1 ± 2.0	1.5 ± 1.1	0.292
	Story memory		0-50	13.4 ± 8.3	11.8 ± 7.1	0.524
Working memory	Digit Span	Forward	0-12	7.5 ± 1.8	7.4 ± 2.3	0.362
	TMT-B	Backward	0-12	5.7 ± 1.8	4.7 ± 1.6	**0.067**
		No. errors	0-25	1.0 ± 3.6	0.6 ± 1.2	0.391
		Time (s)		193.7 ± 108.2	211.1 ± 90.2	0.284
Executive function	WCST	No. categories	0-12	3.4 ± 3.5	2.0 ± 2.6	0.264
		Total no. errors		73.5 ± 35.1	94.4 ± 35.8	**0.043**
		Perseveration errors		40.3 ± 39.3	72.9 ± 47.3	**0.009**
Processing speed	TMT-A	No. errors	0-25	0.3 ± 0.9	0.4 ± 1.4	0.639
		Time (s)		141.4 ± 63.0	164.9 ± 64.7	0.087
Verbal fluency	VFT	Phonemic		10.6 ± 4.3	8.5 ± 2.4	0.057
		Semantic		14.7 ± 4.1	13.9 ± 4.9	0.533
Attention	CPT	No. correct reactions	0-40	30.7 ± 11.1	27.9 ± 13.7	0.461
		Reaction time		581.7 ± 146.5	585.0 ± 236.1	0.617
* The Positive and Negative Syndrome Scale (PANSS); * Chlorpromazine (CP); * Japanese Adult Reading Test (JART): * Japanese Verbal Learning Test (JVLT); * Wisconsin Card Sorting Test (WCST); * Trail Making Test (TMT); * Verbal fluency task (VFT); * Continuous Performance Test (CPT)						

Table 4: Association between the program effects and cognitive function.

divided into the following two groups on the basis of GAF scores after the Program compared with those before the Program: an improved and non-improved group. Neuropsychological test scores were compared between these two groups using Mann-Whitney U tests.

The improved group was composed of participants with positive integers representing changes in efficacy indicator values, whereas the non-improved group was composed of participants with zero or negative integers representing changes in efficacy indicator values. The statistical package for the social sciences (SPSS) Version 21 (IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.) was used for analysis, with a 5% level of significance for two-tailed tests.

This study was approved by the ethics committee of the Showa University School of Medicine (The ethics committee number; 811). The study was conducted in accordance with the Declaration of Helsinki.

Results

Measurements of intervention efficacy by comparison of before and after the Program (Table 3).

CP equivalent dose did not differ significantly before and after the Program (P=0.408). Among self-administered indicators (GAF, SAI-J, and DAI-10), all scores significantly improved after the Program. There were no significant changes in SCoRS-J or GSES scores.

Associations between the effects of the Program and cognitive function (Table 4).

For the GAF, SAI-J, and DAI-10 efficacy indicators that improved significantly, the scores in neuropsychological tests before intervention were compared between the improved and non-improved groups. A significant association was observed only between GAF score and some neuropsychological tests. GAF score was significantly associated with

WCST total number of errors and perseverative errors. In addition, we noted a tendency toward a significant association between GAF score and backward digit span.

Discussion

Comparison between effect and precedent study of the program

We reported on the effects of the Program [7,8] in earlier studies. In fact, some participants in the present study also participated in these previous studies and similar effects were observed. In previous study, significant improvement was observed in the GAF, SAI-J and DAI-10.

Baseline characteristics, PANSS scores, JART scores, and other scores obtained in the present study suggest that the present group of participants had moderate Schizophrenia with moderate psychiatric symptoms and no intellectual delays. They may, therefore, comprise a group with strong potential for good effects from the psychoeducational program as performed in the present study. The CP equivalent dose of antipsychotic drugs taken did not differ before and after the Program, but GAF, SAI-J and DAI-10 improved significantly. The improvement in SAI-J and DAI-10 may have been a result of the effects of drug treatment as well as an improvement in the awareness of the disease from the Program or achievement of medication adherence. The improvement in GAF may indicate an overall improvement in functioning during the Program period. Tsuneoka et al. [7] showed a relationship between re-admittance to the hospital and GAF, indicating that an increase in GAF scores by the Program can also achieve the goal of preventing a recurrence.

By contrast, SCoRS-J and GSES scores improve significantly after the Program. In the present study, SCoRS-J was used to obtain patients' subjective assessment of their cognitive function. Lack of cognitive function training in administrators of the Program could be why we observed no subjective effects of cognitive function improvement in the participants.

Associations between the Program effects and cognitive function

As for our study hypothesis, the severity of the prior cognitive function had an influence on the effect of the psychoeducation. A comparison of participants who improved their GAF scores and those who did not did not show any difference in the number of WCST categories achieved. However, total number of errors was significantly higher in the non-improved group. In particular, non-improvers made a substantially larger number of perseverative errors and performed more poorly on the backward digit span task than the improved group. This performance of the non-improvers suggests that executive function and working memory may affect GAF improvement as an effect of the Program. Listening to the opinions of various instructors and participants during the Program and using those opinions to increase one's own lifestyle skills requires flexibility when incorporating necessary information and ideas. In other words, the tendency of non-improvers to stick to wrong choices and to overlook the possibility of other choices may have strongly influenced the outcome of the Program [11,33].

Effective implementation of a program to assist in hospital discharge during the hospital stay

The present study showed our multidisciplinary psychoeducational program to be useful in improving the various skills needed in life after release from the hospital, such as overall functioning and attitude toward taking medication. We suspect that executive function and working memory at baseline may have affected the Program outcome because of their influence on overall functioning. Further studies are necessary to determine the Program's long-term effects and needed improvements. One such improvement has to do with how the Program is executed. For example, offering somewhat limited information may be more helpful than offering a multitude of options when providing new information. Patients who are fixated on one way of thinking may choose techniques whose results (from the information) are more apparent to them. A second improvement includes considering cognitive impairments that may affect the efficacy of the Program. For example, adding a treatment method to heighten cognitive functioning may improve patients' information processing skills. We are, in fact, currently working on an initiative to improve cognitive functioning in patients with schizophrenia [20]. In the future, we intend to combine such an initiative with the Program to create a more effective treatment program.

What differences do exist between in an improved and non-improved group?

We don't know what differences do exist between in an improved and non-improved group? However, we speculate that executive function and working memory at baseline may have affected the Program outcome because of their influence on overall functioning, i.e., frontal lobe dysfunction. The insufficient recover of this dysfunction affect the efficacy of the Program. We consider the function related with frontal lobe one is affected the Program outcome and "motivation" is the important factor for the discrimination of the efficacy of the Program. Regretfully, we didn't evaluate the motivational level at base lime (before the Program). However, we consider that the patients with relative high motivation got remission. We should study this issue in order to improve the Program more efficacious one.

Study limitations

This study has a number of limitations. First, although we compared pre- and post-intervention scores of patients who completed the Program, we made no comparisons with a non-intervention control group. Second, given that the Program was carried out at the same time as drug treatment, it is impossible to distinguish the extent to which improvements were due to medications rather than the Program intervention. Further studies were not able to set up non-intervention control group from an ethical point of view. Because you should contribute it to all patients as part of hospital care. Third, although the present study sample size was relatively large, the intervention period and period for assessing Program effects were relatively short, lasting for only approximately 8 weeks. Long-term studies are needed to determine the duration of the Program effects. Fourth, even though the neuropsychological tests administered in the present study were quite detailed, Gold et al. (1997) cautioned about the difficulty in specifying the realm of cognitive functioning, which tends to be impaired in individuals with schizophrenia. Matsuda [4] pointed out discrepancies in methods for assessing and measuring executive function and working memory throughout the literature. Thus, careful consideration is warranted for appropriate assessing and measuring of executive function and working memory.

Conclusion

We implemented a treatment program based on multidisciplinary psychoeducational intervention for patients with schizophrenia, who

had been admitted to a subacute care unit in a psychiatric hospital. Baseline characteristics, PANSS scores, JART scores, and other scores of the participants in the present study suggest that all of them had moderately severe schizophrenia with moderate psychiatric symptoms but no intellectual delays, indicating positive Program outcomes. Comparisons of efficacy indicators before and after the Program revealed that the CP equivalent dose of antipsychotic drugs taken did not differ, but that GAF, SAI-J, and DAI-10 scores increased significantly. This increase in test scores suggests that participation in the Program resulted in a certain degree of improvement in overall functioning, awareness of disease, and adherence to medication.

Examinations of cognitive functions that may affect the outcome of the Program suggest that executive function and working memory may be associated with improvement in overall functioning. The tendency of some patients to stick to wrong choices and overlook the possibility of other choices may strongly influence the outcome of the Program. To create an even more effective program, it is important to offer somewhat limited information when providing new information or to use a technique for providing information in such a way that results are more apparent to participants. Furthermore, improving patients' information processing skills may be another useful initiative.

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Conflict of interest

Koji Hori received lecture fees from Eisai Co. Ltd., Pfizer Japan Inc., Novartis Pharma KK, Daiichi Sankyo Inc., Ono Pharmaceutical Co. Ltd., Janssen Pharmaceutical KK, Yoshitomi Yakuhin Co. Meiji Seika Pharma Co. Ltd., and Mitsubishi Tanabe Pharma Co. Koji Hori received funding from by Eisai Co. Ltd., Daiichi Sankyo Inc. and Ono Pharmaceutical Co. Ltd. However, all authors report no conflict of interest about this study and the sponsors had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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