The Effectiveness of Utilizing An Electronic Assistive Device To Improve Attendance in Individuals with Schizophrenia

by
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ABSTRACT

THE EFFECTIVENESS OF UTILIZING AN ELECTRONIC ASSISTIVE DEVICE TO IMPROVE ATTENDANCE IN INDIVIDUALS WITH SCHIZOPHRENIA

by

Sara Davis-Conway

Adviser: Professor Lanny Fields

To date, there is little evidence that traditional cognitive remediation training is effective in improving cognitive and functional deficits in individuals with schizophrenia (SZ). In contrast, accommodation strategies (Velligan, 1996, 2000, 2002) have proven successful at improving the functioning of these individuals. The current study evaluated the ability of an electronic assistive device (EAD), to improve Day Treatment program attendance of SZ individuals. Similar treatments have proven effective in individuals with cognitive deficits due to head injuries (Wilson, 1997, 2001). A within subject baseline-treatment-post-treatment design was utilized in six SZ participants.

Shifts in level of responding correlated with presence/absence of the pager were apparent in 3 of 6 participants. Time series analyses utilizing MANWAL 7 (Williams and Gottman ,1982) were conducted on each participants' attendance, to detect changes in level across conditions. There was no evidence of autocorrelation in attendance data. One responder demonstrated a significant level change ($p<0.01$). Two other responders showed non-significant improvements in level ($p<.02$, and $p<0.04$). In contrast, the three non-responders did not demonstrate significant level change ($p = 0.32$; $p = 0.77$; CR, and $p = 0.41$). Post hoc secondary measures that characterized the effect of the EAD on the psychological and cognitive status of participants were examined. Responders scored 1-2

SD below the mean on NP tests measuring verbal, non-verbal and working memory and verbal fluency. Two non-responders performed well above the mean on these measures and another scored 2 SD below the mean on these tasks and measures of attention. Measures of psychopathology did not discriminate responders and non-responders, with the exception of one non-responder who demonstrated increased hostility post-treatment.

These findings support the hypothesis that an EAD is an effective tool for accommodating for NP deficits, in a subset of individuals with schizophrenia. These are mid-spectrum patients who demonstrate significant neuropsychological impairments in memory, working memory and verbal fluency yet whose attention is grossly intact. The results also indicate that individuals with increased hostility levels may be unable to benefit from pager treatment. Cut-off scores on NP assessments and hostility levels should be developed to determine which patients would benefit most from EADs.

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I would like to dedicate this document to my family and in-laws in honor of their love and support. To my "team," my mother and sisters are always there for me during good times and bad and whose constant commitment made it possible for me to find the time to work. To my husband, Avi, who has been there for me throughout this process and whose love and respect helped me get over all the bumps in the road. To my three beautiful girls Esther, Elisheva and Chava, who are now and will always be my reason for being. To my father, of blessed memory, whose strength and wisdom continues to inspire me from heaven.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Schizophrenia (SZ) is a chronic psychiatric disorder characterized by a disruption of cognition, emotion, affect as well as behavior and community functioning throughout the lifespan. Many recent studies demonstrate an association between the functional deficits seen in these patients and the presence of neuropsychological (NP) deficits in the areas of attention, memory and executive functions (Gold, Randolph, Carpenter, Goldberg, & Weinberger, 1992). A meta-analysis by Green, Kern, Braff, & Mintz, (2000) concluded that secondary verbal memory, immediate verbal memory, card sorting, vigilance and verbal fluency are the NP measures most associated with outcome among studies of community functioning, disability, social skills, problem-solving, and psychosocial skills acquisition. Existing pharmacological treatments have not been completely successful at ameliorating the NP performance, social disability and skills deficits seen in individuals with schizophrenia (Corrigan & Storzbach, 1993; Silverstein, 2000). This resulted in increased interest in examining the effects of non-pharmacological, psychosocial treatments to improve the daily functioning of these individuals.

To date, however, existing psychosocial treatments have not proven successful at improving these functional deficits. A recent meta-analysis by Pilling, Bebbington, Kuipers, Garety, Geddes, Martindale, Orbach & Morgan (2002) concluded that there were no clear benefits of social skills training on relapse rate, global adjustment, social functioning quality of life or treatment compliance. Likewise, cognitive remediation does not appear to benefit attention, verbal or visual memory, planning cognitive flexibility or mental state. In addition, a recent Cochrane Review found that the data on the effectiveness of cognitive remediation in the amelioration of NP deficits in

schizophrenia are inconclusive. Thus there is no evidence for or against cognitive rehabilitation as a treatment for schizophrenia (Hayes and McGrath, 2003).

COGNITIVE REMEDIATION

In general, existing cognitive remediation techniques fall into three main treatment approaches: cognitive enhancement strategies, comprehensive strategies and accommodation strategies.

1. Cognitive enhancement strategies are methods that seek to enhance particular cognitive operations through paper and pencil or computerized exercises thought to target that cognitive operation. These strategies do not involve training in real life functioning.
2. Comprehensive strategies integrate cognitive enhancement exercises into rehabilitation programs that target either life skills, social skills or work skills.
3. Accommodation strategies are methods that help patients work around disabling cognitive deficits.

Cognitive Enhancement Strategies

The majority of cognitive remediation research utilizes the Cognitive Enhancement approach, also known as the general stimulation approach. This approach consists of repeated drills and exercises, using either paper and pencil or computerized tasks, in an attempt to remedy an identified NP deficiency. These techniques operate under the assumption that, like a muscle, the brain will gain capacity with repeated practice in areas that are weak. In the case of chronic schizophrenia, the assumption is that these individuals have lost the capacity to utilize certain cognitive abilities owing to

their underutilization (resulting from the illness itself and/or custodial treatment). Thus, increased exposure and practice should improve these cognitive capacities.

A literature review was conducted, looking at the effectiveness of cognitive enhancement approaches in improving cognition and functioning in individuals with schizophrenia. Fourteen studies were found. The results are presented in Table 1.

Table 1

Review of Cognitive Enhancement Strategies in Individuals with Schizophrenia: Treatment Effects Upon Targeted Mental Operation and Functional Outcome Measures

	NP Outcome for Targeted Mental Operation			Functional Outcome Measures		
Mental Operation Targeted By Treatment	Significant Improvement	No Significant Improvement	Mixed Results	Significant Improvement	No Significant Improvement	Mixed Results
Attention	2	2	2	1	0	0
Attention and Memory	0	0	1	0	0	0
Memory	0	1	0	0	0	0
Executive Functions	2	2	0	2	1	1

Table 1 summarizes the current literature investigating the use of Cognitive Enhancement Strategies in schizophrenia. Of the 14 studies included in the review, only 4 of them reported significant improvements in the mental operation targeted by the treatment. In addition, only five studies included functional outcome measures that measured improvements in psychopathology, work functioning or life functioning as a result of the treatment. Of these 5 studies only 3 studies reported any significant findings in these areas. To date, there is no evidence that cognitive enhancement strategies are

effective in improving the cognitive functioning or life functioning of individuals with schizophrenia.

Comprehensive Approaches

The second most widely utilized cognitive remediation approach in individuals with schizophrenia is the comprehensive approach. In this approach, general stimulation techniques are utilized in conjunction with social skills or vocational training. This treatment technique is based upon two assumptions. 1) That NP deficits interfere with the ability of individuals with schizophrenia to be successful in psychosocial skills training programs. This is supported by studies such as that of Mueser, Bellack, Douglas, & Wade (1991) who showed that patients performing poorly on the Wechsler Memory Scale were unable to benefit from a social skills training program while those with an intact memory did benefit. 2) Remediation of NP deficits will enhance the benefits of these skills training programs.

A literature review was conducted, looking at the effectiveness of the comprehensive approach in improving cognition and functioning in individuals with schizophrenia. Four studies were found. The results are presented in Table 2.

Table 2

Review of the Comprehensive Approach to Cognitive Remediation in Individuals with Schizophrenia: Treatment Effects On Targeted Mental Operation, Functional and Psychosocial Outcome Measures

		NP Outcome for Targeted Mental Operation			Functional Outcome Measures		
Mental Operation Targeted By Treatment	**Targeted Psychosocial Skill**	Significant Improvement	No Significant Improvement	Mixed Results	Significant Improvement	No Significant Improvement	Mixed Results
Executive Functions	Social Skills	0	1	1	0	1	1
1) Attention 2) Memory 3) Executive Functions	Work	0	1		0	1	0
1) Attention 2) Memory 3) Executive Functions	Social Skills	0	0	1	0	0	0

Table 2 summarizes the literature investigating the use of comprehensive strategies in individuals with schizophrenia. Of the four articles found, none of them reported significant improvements in the NP domain targeted. In addition, none of the studies reported evidence that there were functional improvements in patients' work, psychopathology or life functioning. To date there is no conclusive evidence that comprehensive approaches to cognitive remediation are beneficial in improving the NP and functional performance of individuals with schizophrenia.

The Accommodation Approach

Accommodation strategies utilize compensatory strategies, i.e. environmental changes, external aids, to help participants overcome NP deficits. This strategy of remediation is guided by the assumption that cognitive rehabilitation techniques must 'work around' deficits by making use of external supports. The use of external aids to

overcome functional deficits is the most favored approach for treating functional deficits caused by NP impairments in brain-injured patients. Examples of accommodation techniques for cognitive deficits include the use of lists, calendars wall charts (consisting of reminders and prompts,) memory notebooks and electronic assistive devices (EAD). Surprisingly, only one research group to date has published studies examining the use of accommodation strategies in individuals with schizophrenia.

To date, the only published studies investigating the use of accommodation strategies in individuals with schizophrenia used Cognitive Adaptive Training, CAT, (Velligan, Mahurin, True, Lefton & Flores, 1996). In CAT training the patient's environment is altered to compensate for cognitive deficits and improve adaptive functioning. This intervention was based upon a specific set of procedures prescribed for individuals with certain cognitive and functional strengths and weaknesses. Intervention procedures may include the use of labels, signs, schedules, checklists, and/or electronic cueing devices as well as removal of distracting stimuli. These methods are similar to the photographic activity schedules developed by Krantz, MacDuff and McClanahan (1993) in patients with autism, where patients are given a notebook with photographic cues that prompt them to perform home and family activities such as chores, social interactions, self-care and housekeeping tasks.

The efficacy of CAT training was first studied in state hospital inpatients with schizophrenia, comparing 20 participants receiving standard psychosocial treatment to 20 receiving standard treatment plus CAT. The two groups were matched on initial levels of functional impairment, symptomatology, and length of hospital stay (Velligan, Mahurin, True, Lefton, & Flores, 1996). Length of treatment averaged 9.52 weeks (SD=3.96).

CAT intervention was determined according to each patient's level of executive impairment based on the Allen Cognitive Levels Test (ACL). CAT participants improved significantly more than controls on measures of adaptive functioning, but no differences between groups were found in symptom ratings (Brief Psychiatric Rating Scale expanded version (BPRS-E) thought disorder factor score and Negative Symptom Assessment (NSA) global score) where both groups showed improvement.

Velligan, Bow-Thomas, Huntzinger, Ritch, Ledbetter, Prihoda, & Miller (2000) subsequently completed a randomized controlled trial with 45 patients with schizophrenia or schizoaffective disorder, recently discharged from a state psychiatric facility. Participants were randomly assigned to one of three treatment conditions: a) CAT weekly; b) yoked contact, where participants received home visits of equivalent duration and attention to CAT, as well as non-therapeutic changes to their environment (e.g. a poster or a potted plant) to control for non-specific effects of environmental changes required by CAT; or c) standard follow-up. At baseline, participants cognitive functioning (in attention, memory and executive domains), adaptive functioning (FNA), behavioral apathy and disinhibition (Frontal Lobe Personality Scale), and environmental needs were assessed. Participants were also assessed every three months for nine months on the BPRS-E, NSA, Global Assessment of Functioning (GAF) and the Multnomah Community Ability Scale (MCAS). An analysis of covariance (baseline assessments scores as covariates) with planned comparisons of CAT with both of the other two groups and correcting for multiple comparisons (Dunnett's procedure) was applied. The CAT group demonstrated significantly more improvement than the control groups in

symptomatology, motivation, and adaptive functioning. The CAT group also had significantly fewer relapses to illness state than the control groups.

Velligan et al. (2002) utilized the same 3-group design with a second sample of 45 patients with schizophrenia or schizoaffective disorder. Participants were recruited from public psychiatric outpatient clinics and had been discharged from the hospital for at least three months (community tenure ranged from 3 months to 7 years, averaging 18 months). The CAT group demonstrated greater improvements in adaptive functioning, quality of life, and positive (but not negative) symptoms than both control groups. The success of CAT training warrants the use of other accommodation strategies in individuals with schizophrenia.

The current study extended Velligan's investigation by evaluating whether accommodation strategies, similar to those currently used in neurological patients, can change the behavior of individuals with schizophrenia. To do this, the investigator turned to the head injury literature for novel treatment approaches that might prove helpful in improving the independent functioning of patients with schizophrenia by compensating for NP deficits.

The utility of using an electronic assistive device (EAD, like a pager) as a cognitive prosthesis has been studied in patients suffering from traumatic brain injury and stroke. In these studies patients were provided with alphanumeric pagers and were paged throughout the day with a series of reminders, developed with the patients, aimed at remediating specific deficits in daily living skills. This approach seems promising for individuals with schizophrenia since it is simple, easy to carry and has been extremely beneficial in the head injury population.

Wilson (1999) presented an A-B-A-B single case study of a 23 year-old male with severe memory impairments. With the use of the pager, the patient demonstrated significant improvement in tasks such as preparing meals, putting his medication out, and taking his keys when he left the house.

Evans, Emslie, & Wilson (1998) presented another A-B-A-B, single case study of a fifty year-old woman who suffered a cerebral vascular accident and subsequently demonstrated specific executive impairments of attention, planning, initiation and increased distractibility, with relatively intact general intellectual and memory functioning. This patient showed an improved ability to initiate activity in a timely manner by using the assistive device and her ability to initiate activity declined drastically when the device was taken away.

Hersh & Treadgold (1994) reported significant improvement in self-initiated attendance at weekly life skills and group government meetings in a transitional living facility for persons (N=4) with brain injury with mild to severe memory dysfunction.

Wilson, Evans, Emslie, & Malinek (1997) found that a pager produced a significant improvement in the percentage of life tasks achieved in 15 brain injured patients, provided a pager in an ABA single-subject design. For some participants, three months of the protocol was sufficient to establish routines, and the improvement was maintained when the protocol was discontinued, as observed during the post-treatment condition. For others, their performance deteriorated when the experimental protocol was discontinued suggesting that they would require long-term use of the paging system.

Wilson, Emslie, Quirk, & Evans, (2001) conducted a larger, randomized control trial, involving a crossover design with 143 participants suffering from one or more

deficits in memory, planning, attention or organization as a result of traumatic brain injury or stroke. Patients were provided with EADs that delivered preplanned pages throughout the day. The patients' performance of target behaviors, over a two-week time interval, was assessed at baseline, 7 weeks and 14 weeks post baseline. The results indicated that 84.6% of the participants who completed the 16-week trial were significantly more successful in carrying out target behaviors when using the pager, compared with the baseline period.

The efficacy of EAD with brain injured patients suggests that a similar strategy might also enhance behavior of individuals with schizophrenia.

Outpatient non-attendance in Psychiatric Day Treatment Centers is a severe and widespread problem that has severe clinical and economic costs (Bender & Pilling, 1985; Killaspy, Banerjee, King, & Lloyd, 2000, Wright and Lunt, 1995). Patients exhibiting poor attendance to their outpatient programs are hospitalized more often, are more likely to be of risk of harming themselves or others and are in general, more impaired than participants who regularly attend their outpatient programs. The current study investigates if an EAD can improve the attendance of individuals with schizophrenia to their day treatment program.

Bender and Pilling (1985) examined attendance data on consecutive admissions of a Day Treatment Center in London for a three-month period. Of the 50 consecutive admissions examined, 15 were classified as "under-attenders" (having attended the day treatment program less than 1/3 of the time), 25 were considered "stayers" (having attended for more than one third of the time), and 10 patients never attended. The average attendance for all sessions for "under-attenders" was 15% of all sessions and for

stayers was 72% of all sessions. Over a three-month time period, nearly 40% of participants enrolled in the day treatment program never attended program or attended less than 15% of the time.

These results are extremely troubling since research indicates that participants who do not attend their Day Treatment Programs are usually more ill and at higher risk, therefore requiring the constant supervision of a Day Treatment Program. Killaspy et al. (2000) followed 365 patients who were randomly selected from the consecutive admissions to an adult psychiatric outpatient program in London for twelve months. The patients were divided into attenders and non-attenders based upon their attendance to the first outpatient appointment within an eight month period. Killaspy et al. (2000) found that participants who were non-attenders were more "unwell," more socially impaired, had higher drop out rates from out-patient services and had a larger number of subsequent admissions to inpatient facilities than attenders.

Though the problem of non-attendance to Day Treatment programs is widespread and often involves the most impaired of patients, the reasons why under-attendance is so prominent in these patients and what can be done to remedy this problem, has only been explored in a few studies. It is often assumed that psychopathology is the main cause of under-attendance in these patients. However, Bender and Pilling (1985) who followed 60 new admissions to a Day Treatment program found no significant differences between good attenders and poor attenders as a result of Axis I diagnosis or the presence or absence of psychotic symptoms. In fact, Bender and Pilling (1985) found that poor attendance to day treatment was associated with the Mill Hill Test, a measure of verbal ability. McGurk (2004) found that cognitive functioning, specifically executive functions

as measured by the Wisconsin Card Sort categories, predicted 20% of total outpatient service use. Killaspy et al. (2000) reported that 27% of follow-up non-attenders and 11% of new patient non-attenders to a psychiatric outpatient program reported that they missed their appointment because they forgot about it.

Impairments in verbal memory and executive functioning (i.e. volition, planning, initiating, organizing, taking feedback) are consistently seen in individuals with schizophrenia and schizoaffective disorder. There are a number of ways in which NP deficits serve as a barrier to the rehabilitation process. These deficits make it difficult for these individuals to negotiate their way to their rehabilitation program each day and follow a structured schedule of rehabilitation activities. For example, those with poor memory may find it difficult to remember their schedule of rehabilitation groups and appointments while others with executive functioning deficits may find it difficult to get to appointments because of deficits in initiating and planning. A number of studies found that NP deficits interfere with the ability of individuals with schizophrenia to benefit from their psychosocial treatment programs (Wykes, Stuart, & Katz, 1990; Wykes, Katz, Stuart, & Hemsley, 1992) and their success in social skills training (Spaulding, Sullivan, Weiler, & Reed, 1994). A number of studies also concluded that NP deficits affect the work functioning and tenure of work history in patients with schizophrenia. Gold, Goldberg, McNary, Dixon, & Lehman (2002) found that deficits in attention, working memory and problem-solving were significantly correlated with length of employment in 40 patients who were part of a vocational rehabilitation program. Bell & Bryson (2001) found that performance on NP tests predicted change in the Work Behavior Inventory Scale, a measure of social skills, cooperativeness, work habits, work quality, and personal

presentation. NP deficits also explained up to 79% of the variance in improvement for work habits in patients who participated in a work rehabilitation program.

Due to the evidence that NP deficits interfere with the ability of patients' to regularly attend and benefit from their treatment programs, treatment providers often utilize paper and pencil schedules or memory notebooks in this population. These interventions have had limited success. Patients report that memory notebooks embarrassing and difficult to carry. In addition, due to difficulties in memory and executive functions participants often forget or fail to initiate the use of their paper schedules.

Potential strengths of the EAD over traditional paper and pencil schedules that are typically utilized in treatment programs, are that they are simple to use and can be carried at all times without embarrassment (in contrast patients often see the EAD as a status symbol.) In addition, the EAD also directly addresses memory and executive deficits by inherently providing reminders and prompts. It puts the client in control by enhancing their ability to self-initiate and self-cue, rather than rely on others (whether staff, friends or family) for reminders and prompts, which may be perceived as demeaning by the client or causing tension with the staff. Thus, while well intentioned, the common practice by rehabilitation staff of "rounding up" clients to attend activities may be counterproductive to the rehabilitation process.

To date, the use of EAD has not been reported with individuals having psychiatric illness. It was hypothesized that if NP deficits were playing a role in non-attendance, the use of an EAD would improve attendance to the treatment program and/or individual

groups. The goal of the current study was to evaluate the benefits of using an EAD as a cognitive prosthesis in individuals with schizophrenia.

METHODS

Design

The experiment consisted of an A-B-A (baseline-treatment-baseline) single subject design. A within subject design allows causal inferences to be drawn about the relationship between independent variables and the measured behaviors. This design is ideal for intervention research where the independent variable is implemented over time and individual variation is an important consideration.

Pilot Investigations

Twenty Patient Sampling Project

Prior to the initiation of the current study a retrospective project was conducted to examine the attendance patterns of 20 randomly selected Day Hospital participants who were diagnosed with schizophrenia or schizoaffective disorder. Group attendance was monitored over a four-month stay in Day Hospital to see if any general patterns of attendance emerged. This Sampling Project 1) identified an attendance problem in the Day Hospital and 2) determine whether patients demonstrated a pattern of increasing or deteriorating attendance over time. Attendance data to individual groups were obtained using Day Hospitals Fox Pro attendance program. Eighty five percent of the patients included in the twenty patient sample, demonstrated attendance rates that were between 20-70% of their scheduled groups in Weeks 2-7. The mean attendance rate was 49 (range =15-86 SD =19.7). This indicates that the patients in this pilot study missed, on average, 50% of their scheduled groups.

Table 3

Average Percentage of Attendance to Groups for Sample Patients (n=20) During Weeks 2–7, 8-12 and13-16

Patient	2 to 7	8 to 12	Wk 13-16
1	52	35	18
2	20	*	*
3	36	13	5
4	86	65	*
5	19	18	17
6	55	56	48
7	62	55	33
8	29	45	64
9	68	46	51
10	58	41	48
11	36	34	40
12	24	41	44
13	61	56	80
14	52	50	21
15	38	49	33
16	55	44	41
17	72	41	19
18	28	25	41
19	53	66	76
20	70	*	*

* Patient discharged from the program

Table 3 contains the average percentage of groups attended by each of the 20 patients during weeks 2-7, 8-12 and weeks 13-16. The data indicated that eighty percent of the patients sampled demonstrated a deteriorating pattern of attendance over the course of their 4-month stay.

Development and Pilot Testing of Training Materials

A training procedure was developed to teach patients how to use the pager and to evaluate the participant's competency in using each function. The training manual was divided into Pager Training, Training Log (Appendix G) and Non Group Related Pages Training Log (Appendix H). Pager Training was based upon the manual provided by the company. The manual contained simple language and graphics and was designed to teach the participants the function of each of the keys on the pager and how to utilize all of the pager functions. The pager functions the participant had to master include 1) reading messages 2) replying to messages and 3) deleting messages.

The Training Log was designed to test the participants' ability to use pager functions in the presence of the experimenter and was divided into three sections. Participants were required to use each pager function correctly on five consecutive practice messages before training began on the next function.

In the first section, participants were asked to answer a number of practice messages through the pager (e.g. Today is Wednesday) independently, in the presence of the experimenter. To ensure that participants had no difficulty reading from the pager, they were asked to read the message aloud to the experimenter. If the participant appeared to find reading the pager difficult, the experimenter evaluated the source of the problem (e.g. needing glasses) and attempted to resolve the issue prior to the initiation of the study.

In the second section, participants were sent a series of yes or no questions (e.g. Is today Wednesday?) through the pager and asked to reply using a multiple choice response feature (Please Reply: 1) Yes 2) No).

In the third section, participants were sent pages asking them to delete messages. Criteria for competency were established for each of the functions to determine if participants required additional training.

Five patients in day hospital were trained using the training procedures described above, to determine the utility of the Pager training manual and Training Log. While testing the Training Log one of the patients reported having difficulty reading the pager in certain light and in certain sections of Day Hospital. As a result, the Non Group Related Pages Training Log was added. In this phase the experimenter sent the participant a series of messages (not related to attendance and groups), which required the participant to perform tasks in the treatment environment (e.g. Give this envelope to the secretary.) The Non Group Related Pages Training Log 1) Gave participants the opportunity to use the pager in their natural environment, giving the experimenter the opportunity to address any problems prior to the initiation of the experimental procedures 2) Allowed for the assessment of the participant's competency in the use of the pager outside of the presence of the experimenter. 3) Demonstrated that transmitted pages served as discriminative stimuli or effective prompts. Participants proceeded to the next phase of the study when they complied with 8 of the last 10 pages received and correctly utilized all the features of the pager correctly while answering these pages. The final manual is included in Appendix G.

Participants

Inclusion Criteria

All participants were screened for the following eight inclusion criteria. All the criteria had to be satisfied for inclusion in the study. 1) All individuals recruited for this

study attended Hillside Hospital's Day Treatment Program (Day Hospital). Day Hospital is a comprehensive outpatient program that is geared toward individuals with severe mental illness who are able to live at home or in the community but still require daily psychiatric monitoring. This program was selected since most clients are admitted following a recent hospitalization and are in an early recovery stage. This is a time where an assistive device might be most beneficial since patients have to learn how to fend for themselves, using a paper and pencil schedule, after being in the structured environment of the hospital. 2) All participants approached for the study had to be diagnosed with schizophrenia (SZ) or schizoaffective disorder (SA). 3) All participants recruited for the study had to be fluent in English. This was required to ensure that participants were able to complete the NP test battery and to ensure that they were able to read the directions provided by the EAD. 4) Participants were not approached for the study if they were diagnosed with a primary neurological disorder. The efficacy of EADs in patients with neurological disorders has been investigated in previous research studies and the investigator wanted to limit the target of the current study to individuals with SZ and SZ-A. 5) Participants approached for the study could not have received Electroconvulsive Therapy (ECT) treatments within the past 2 months. ECT is known to create short-term adverse effects on memory. Thus recent ECT could affect baseline NP testing. In addition, recent ECT could interfere with the ability of individuals to learn how to use the EAD. 6) Participants were only approached for the study if during the baseline period they attended between 20-70% of their scheduled groups. These cutoffs were selected to prevent possible floor and ceiling effects. Floor effects were likely if participant's baseline attendance was below 20%, since initial attendance was so poor that it would be

difficult to improve attendance in a meaningful way. In addition, low baseline attendance would impact recruiting and training, as individuals with such poor attendance almost never attend their day treatment program. Ceiling effects were likely if participants' baseline attendance was greater than 70%, since there would be little room for improvement. 7) Participants were not recruited for the study if external factors, such as difficulties with transportation, legal problems or medical disabilities, were identified as the cause for their poor attendance. To screen for this, each possible recruit was asked if they felt they had any attendance difficulties and what were causing them. In addition, possible recruits were asked if they felt very strongly about not attending any of their groups. 8) Informed consent was obtained prior to the initiation of any further contact with the participants. Refer to Appendix F for a copy of the informed consent form.

Description of Recruiting and Refusers

Recruiting for the study took place between the dates of 7/1/01-12/15/01 and 3/15/01- 8/15/02. During this time, 98 patients who had a diagnosis of SC or SC/A were enrolled in Day Hospital and underwent the screening process.

Fifty-three patients did not meet the inclusion criteria for the study. Of these fifty-three patients, ten patients did not meet the following inclusion criteria: ECT within the past two months, MR, primary neurological impairment. Fifteen of the fifty-three patients had external reasons for their absences (medical illness, physical therapy appointments; transportation difficulties, absence from certain groups for particular reasons). Twenty of the fifty-three patients had attendance rates that were above the seventy percent required for inclusion in the study. Eight of the fifty-three patients had

attendance rates that fell below the twenty percent cutoff required for inclusion in the study.

Nineteen patients who met the inclusion criteria for the study were discharged from Day Hospital prior to recruitment and two patients were readmitted to the inpatient units. Six patients were enrolled in other studies and therefore could not be approached for the current study. Eleven patients who met the inclusion criteria refused to participate in the study. Reasons for refusing the study included, not wanting to be involved in research, wanting to get paid for their time, not believing they had a mental illness, and not needing a beeper to remind them to do things.

Seven patients met criterion for the study and informed consent was obtained. One patient had to be dropped because he was not attending training sessions.

Description of Participants

Six participants who consented and completed the study are described in Table 4.

Table 4

Participant Demographics

Participant	**RI**	**PR**	**GD**	**FL**	**RC**	**AM**
Age	35	26	25	29	28	32
Gender	F	M	M	M	M	M
Race	Hispanic	Afro-Caribbean	African American	Hispanic	African American	Caucasian
Diagnosis	Schizophrenia Disorganized	Schizo-affective	Schizophrenia Paranoid	Schizo-affective	Schizo-affective	Schizophrenia Paranoid
Age 1st Treated	33	21	23	17	22	26
Education	14	12	GED	14	13	12
Age Learned English	17	17	Native Speaker	Native Speaker	Native Speaker	Native Speaker

Participant RI is a 35 year old, divorced, Hispanic female with a diagnosis of schizophrenia, disorganized type who lives with a roommate in a private apartment as part of a housing program. Participant RI is a high school graduate and earned an LPN certificate from Bronx Community College. Participant RI held a number of jobs prior to developing symptoms, as a home health aide and home attendant. Participant RI is fluent in English despite the fact that she learned English at the age of 17. Participant RI has a five- year history of auditory hallucinations, thought disorder, flat affect and confused thoughts. At baseline, RI had difficulty attending her scheduled groups. During screening, participant RI denied any external reasons for not attending her groups.

PR is a 26-year old, single, Haitian male with a diagnosis of schizoaffective disorder who lives in a private apartment with his mother, sister and aunt. PR is a high school graduate and since his graduation from high school has held a variety of odd jobs in the fast food industry and as a garbage collector at John F Kennedy Airport, but has

been unemployed since developing symptoms of his illness. PR is fluent in English, despite the fact that English is his second language and he learned it at the age of 17. PR has a 4-year history of hallucinations and delusions, including command hallucinations. PR also has a past history of cannabis dependence and alcohol abuse. At baseline, PR had difficulty attending his scheduled groups. During screening, PR denied any external reasons for not attending his groups.

Participant GD is a 25-year old, single, African American male with a diagnosis of schizophrenia, paranoid type, who lives in a private home with his parents. PR dropped out of high school in the 11th grade and subsequently got his GED and is currently unemployed. Participant GD is fluent in English and has a 2-year history of auditory hallucinations, paranoid ideation, apathy and lack of motivation. At baseline, GD had difficulty attending his scheduled groups. During screening, participant GD denied any external reasons for not attending his groups.

Participant FL is a 29-year-old, single, with a diagnosis of schizoaffective disorder. Participant FL is a high school graduate and attended Queens College for 2 years. Participant FL has held a number of telemarketing jobs, the longest lasting 3 months, but is currently unemployed. Participant FL is fluent in English and has a 12-year history of suspiciousness, delusions, depression, anxiety and suicidal ideation. At baseline, FL had difficulty attending his scheduled groups. During the screening process, participant FL denied any external reasons for not attending his groups.

Participant RC is a 28-year old, single, African American male with a diagnosis of schizoaffective disorder who lives with his parents in a private home. Participant RC is a high school graduate and attended 1 year of college. He is currently unemployed.

Participant RC is fluent in English and has an 8-year history of disorganized thinking, mood swings and poor medication compliance. Participant RC also has a history of cannabis abuse. At baseline, RC demonstrated difficulties attending all his scheduled groups. During the screening process, participant RC denied any external reasons for not attending his groups.

Participant AM is a 32-year old, single, Caucasian male with a diagnosis of schizophrenia, paranoid type who lives in an apartment program. Participant AM is fluent in English and has a six-year history of paranoid ideation, auditory and tactile hallucinations, delusions, anxiety, disorganization, avolition, poor medication compliance and poor self-care. Prior to developing symptoms of his illness, participant AM was employed as an electrician assistant. At baseline, AM had difficulty attending his scheduled groups. During the screening process, participant AM denied any external reasons for not attending his groups.

Materials

All participants included in this study received an electronic assistive device (EAD) which was a Motorola PF1500, alphanumeric pager with a screen holding 4 lines of text, an enter button, an up and down cursor button and a backspace button. These pagers were chosen since they were simple enough for participants with cognitive deficits to utilize while at the same time they had the technological capabilities required for the study.

Messages were sent to the EADs using Schedule Wizard Software, a software program that has the capability to store a large number of text messages, and can then send the messages to the participant's pager via e-mail. The EAD beeped and/or vibrated

each time the participant received a new message signifying that s/he should read the text message. In addition, the EAD has a reply feature whereby the experimenter can send a message that is a question and the participant can respond by selecting one of several choices. Refer to Appendix D for a picture of the EAD.

Procedures

Table 5

Study Timeline

Procedure	Brief Description
1) Baseline and Screening	- Attendance monitored for a minimum of 4 weeks beginning any time after the second week of admission.
	Inclusion criteria 1) Enrolled in Zucker-Hillside Hospital's Day Treatment Program 2) Diagnosis of schizophrenia (SZ) or schizoaffective disorder (SZ/A). 3) Fluent in English. 4) Absence of primary neurological disorder. 5) Absence of exposure to ECT for 2 months. 6) Attend 20-70% 7) No extrinsic reason for non-attendance 8) The participant signed informed consent documents.
2) Assessment	- NP assessments - Brief Psychiatric Rating Scale - Program and Group Satisfaction Questionnaires - Self Report Measures of Support - Self Report Measures of Subjective Cognitive Impairment
3) Training	- Pager Training Manual was utilized to train participants in the use of the pager. - Pager Training and Efficacy Log was utilized to monitor the participant's proficiency in the use of pager features (Respond, Reply and Delete) in both the experimenter's presence and in the participant's real life environment. - Participants cannot proceed to Experimental Treatment Phase until has met all specified training criteria.
4) Experimental Intervention	- Participant carries EAD. - Paged to wake up, leave for program, and attend 80%of scheduled groups. - Twenty percent of groups were unpaged and served as probe groups. - Attendance data were collected
5) Reassessment	- Brief Psychiatric Rating Scale - Program and Group Satisfaction Questionnaires - Follow Up Pager Questionnaire - Self Report Measures of Support
6) Post Experimental	- Attendance data were collected. - No pages were sent. - No contact with participant.

Baseline and Screening

Table 5 contains a brief description of the study design and procedures. Data regarding the participant's attendance to program, as well as attendance to each scheduled group were collected for each of the participants for a minimum of two weeks. This served as baseline data. Attendance data were available through the Hillside Hospital's Day Treatment Program computerized FoxPro database. Attendance data were calculated from the Day Hospital Progress Notes. Attendance data were calculated as the percentage of the scheduled groups that the participant attended per day. On days when participants did not attend any groups, a zero was included in the calculation for that day.

Baseline data collection began at least one week after the participant's admission to Day Hospital. Attendance data from the first week after admission were not included in the baseline data, since attendance patterns in Day Hospital do not become established until the second week after admission. During patients' first week in Day Hospital they are often pulled out of their groups for various intake procedures, which would affect their group attendance.

Assessments

Table 6

Assessments included in the Study

Assessment Type	Purpose of Assessment	Name of Assessment
NP Test Battery	NP Tests	Components listed below
Interviews	Psychopathology	The Brief Psychiatric Rating Scale (BPRS)
	Program and Group Satisfaction	Patient Satisfaction Questionnaire
	Satisfaction/ Compliance with Assistive Device	Follow -Up Pager Questionnaire
Self Report Measures	Measure of Support	The Urging Subscale of The Involvement Evaluation Questionnaire (Urging Scale)
	Subjective Measures of Cognitive Functioning	The Patient Assessment of Own Functioning Inventory (PAOFI)
		The PROMS Memory Questionnaire

Table 6 enumerates the assessments administered to each of the participants. The following assessments were included for the purpose of post-hoc analysis to describe the 6 patient sample. All participants received a two-hour battery of NP tests that measured attention, memory and frontal lobe functions (See below for a complete description). In addition, each participant's psychopathology, program/group satisfaction, support and subjective cognitive impairment were evaluated using a number of structured and semi-structured interviews and self report measures. These interviews and self-report measures took approximately ninety minutes to complete.

NP Test Battery

Neuropsychological impairment in schizophrenia has been recognized for almost a century. Kraepelin wrote "behavior is without a doubt nearly related to the disorder of attention which we very frequently find conspicuously developed in our patients" (Kraepelin et al., 1919). The finding that patients with schizophrenia perform more poorly on a wide range of cognitive tasks than do normal controls has remained consistent since the beginning of the century. Research indicates that NP impairment is present at an early stage in the onset of schizophrenia, is independent of symptom and drug effects and is therefore increasingly regarded as behavioral evidence of the neuropathology underlying schizophrenia (Gold & Harvey, 1993; Gold & Weinberger, 1995; Hill, Ragland, Gur and Gur, 2004). In addition, NP deficits are currently believed to be fundamental manifestations of the illness itself. (Albus, Hubmann, Ehrenberg, Forcht, Mohr, Walhim and Hecht, 1996) While NP deficits are central to the concept of schizophrenia, the NP deficit patterns that individual's with schizophrenia present with are heterogeneous. In fact, 25% of individuals with schizophrenia perform in the normal range on many NP assessments (Hill et. al, 2004). This may indicate that these individuals were previously above average and then deteriorated to a normal level or they may have isolated subtle impairments in executive or sensorimotor functioning in comparison to normal performance in other tasks (Hill et. al, 2004).

Due to the prominent role that NP deficits play in the pathology of schizophrenia and the fact that there is heterogeneity in the pattern of NP deficits, while developing the protocol for the current study, one consideration was to include screening procedures to exclude individuals whose NP functioning fell in the normal range. Theoretically, these

individuals would not benefit from a cognitive prosthesis such as the EAD because their cognition remains relatively intact. The problem with this was that there were no published standards to help determine what the cutoff threshold should be and no norms developed specifically for the schizophrenia population. Therefore, the NP data were included to analyze post-hoc and were not predictive of who would benefit from the treatment. Subsequent to the conclusion of this study, norms in a sample of 250 patients with schizophrenia and schizoaffective disorder were developed at the Center for Neuropsychiatric and Rehabilitation Research (CENORR) at the Zucker-Hillside Hospital. These norms were utilized when calculating the z-scores seen when describing the NP data.

Table 7

NP Test Variables Presented in the Current Study

Factor	NP Test Variables included in Analysis
Verbal Knowledge	The Wechsler Adult Intelligence Scale – Revised Information Subtest
Attention	Trail Making Test - Part A
	Stroop Test – Trial 2
Working Memory	Letter Number Span
	Wechsler Memory Scale- Revised (WMS-R) Digits Backwards Subtest
Verbal Memory	The California Verbal Learning Test- Trials 1-5 (CVLT)
	CVLT Long Delay Free Recall
Nonverbal Functions	Wechsler Memory Scale- Revised (WMS-R) Visual Reproduction I and II Subtest
Ideational Fluency	The Ruff Figural Fluency Test – Unique Designs
	The Controlled Oral Word Association Test – Unique Designs
Additional Measures of Executive Functioning	(Trails A- Trails B)/ Trails A
	WCST Perseverative Errors
	Stroop Interference

Table 7 includes each of the NP tests presented in the current study. A brief description of each of the tests, rationales for their use and a brief description of validation procedures are presented below.

Verbal Knowledge: The Wechsler Adult Intelligence Scale - Revised (WAIS-R, Wechsler, 1981a); 1981) Information subtest was included as an estimate of general intelligence. The WAIS-R is the most extensively used measure of intellectual functions. Normative data were provided by the author and were obtained on 1,880 people.

Attention: The Trail Making Test (Trails, Partington & Leiter, 1949) is given in two parts. Trails A was included in this battery as a measure of focused attention. Focused attention requires the individual to reject irrelevant information while attending to relevant input. In Trails A, the participant is asked to connect 25 encircled numbers consecutively on a worksheet. The score consists of the number of seconds it takes the participant to complete the task. Normative data were provided by (Spreen et al., 1998).

The Stroop Test (Golden, 1978) is given in 3 parts. Trial 2- Colors was included in this battery as a measure of sustained vigilance. Sustained vigilance is the ability to focus attention during a continuous or repetitive activity. In this task participants were asked to name the colors of Xs printed in red, green and blue ink. Normative data were provided in the user's manual by the author.

Working Memory: The Digits Backward subtest of the WMS-R (Wechsler, 1981b) was included as a measure of working memory. In the Digit Span Backward task, participants are read a string of numbers and are asked to repeat them in the reverse order. The norms for this test are provided in the manual and were based on 300 cases designed to represent the normal population of the United States between the ages of 16 and 75 (Spreen et al., 1998).

The Letter Number Span is a test of attention/working memory that discriminates individuals with schizophrenia from controls and also explains most of the variance between these groups on the Wisconsin Card Sorting Test (Gold, Carpenter, Randolph, Goldberg, & Weinberger, 1997). This test involves immediate retrieval of a list of randomly presented numbers and letters only in order of ascending numbers followed by ascending letters. The authors report normative data on a sample of 30 normal controls.

Verbal Memory: The California Verbal Learning Test (CVLT) assesses multiple processes and strategies involved in learning and remembering verbal material. (Delis, Kramer, Kaplan, & Ober, 1987). Sixteen nouns, each belonging to one of four semantic categories, are presented in a shopping list format over multiple trials. Recall is assessed after each presentation by requiring the participant to recite as many words as they can remember in any order. Short delay and long delay free and cued (recall is aided by providing category clues) recall trials follow. Recognition is then assessed using a 44-item yes/no forced choice trial. Where participants are read a list of words and asked if each of the words were in the presented shopping list. This differs from recall as participants do not have to generate their own word list. The normative data for this measure are provided in the user's manual, by the author, and were developed using 273 neurologically intact individuals with a mean age of 58.93 (SD=15.35).

Ideational Fluency: The Ruff Figural Fluency Test (Ruff, Light, & Evans, 1987) assesses design fluency, set shifting and self-monitoring. The test consisted of five sheets of paper each containing forty squares. Each of the squares contains five dots and the participants are instructed to make as many unique designs as possible in a forty-five second time period by connecting two or more of the dots with a straight line. In trial one the five dots are symmetrically positioned; in trials two and three the dots are in the same position but in addition to the five dots there is an interference pattern; in trials four and five the dots are asymmetrically positioned. The manual provides normative data for 358 participants broken down by age and education as well as extensive instructions for standardized administration and scoring.

The Controlled Oral Word Association Test (COWAT) is part of the Multilingual Aphasia Examination (Benton & Hamsher, 1978). It requires the participant to produce as many words as possible that begin with specific letters in a 60 second period, with the restrictions that there be no repetitions, no different forms of the same word, and no proper nouns. Normative data were provided in (Spreen et al., 1998) and were based on a sample of participants with ages ranging from 25-64 years.

Non-Verbal Functions: Visual Reproduction, another subtest of the WMS-R (Wechsler, 1987), is a task of immediate and delayed-visual memory. The participants are shown four cards containing abstract pictures of increasing complexity for ten seconds. When the cards are taken away the participants are asked to draw the pictures again from memory immediately and after a thirty-minute delay. The norms for this test were based on 300 cases designed to represent the normal population of the United States between the ages of 16 and 75 (Spreen et al., 1998).

Additional Measures of Executive Functioning: The Stroop Interference Score, (Golden, 1978) was included as an additional measure of executive functioning and response inhibition. This score was calculated by subtracting the Color-Word predicted score (which was calculated from Trial I and Trial II of the Stroop Test), from the actual Color-Word Score obtained (the actual score obtained when participants are asked to name the color ink mismatched words of the colors are printed in.) Normative data were provided in the user's manual by the author.

The Wisconsin Card Sorting Test (WCST, Heaton, 1981) assesses abstract thinking and set shifting. In this task participants are asked to match 128 cards to four stimulus cards. The cards in the deck can be matched to the stimulus cards by number,

form or color; but the participants are not told how to match the cards. The participant must deduce from the pattern of the examiner's response whether they are matching the cards correctly. Normative data were based on a sample of 384 normal controls.

Trails A-Trails B/ Trails A was included as a measure of set shifting. This difference score removes the effect of motor speed from the participant's performance on Trails B (where participants are required to connect, 25 alternating numbers and letters in the proper order.) Normative data were available in Spreen et al., 1998.

NP Test Variable Selection

The NP test variables selected for use in the analysis were determined a priori based upon a review of the literature and the findings of a Principal Components Analysis (PCA- See Table 8) conducted in a large sample of patients with SC and SC-A (Jaeger, Czobor & Berns 2003).

Table 8

List Of NP Tests Examined And Tests Included In Each Of Six Stable Factors

(As reported by Jaeger, Czobor & Berns, 2003) Measures in bold were included in present study.

Neuropsychological Tests Included In PCA	Stable Factors Derived from the PCA
Wechsler Adult Intelligence Scale-Revised Wechsler Memory Scale Revised Letter Number Span	VERBAL KNOWLEDGE WAIS-R – Vocabulary **WAIS-R – Information** WAIS-R – Comprehension WAIS-R – Similarities
Complex Ideational Material Concentration Endurance Test (D2) Stroop Test	ATTENTION FACTOR D2- letters minus errors **Stroop-words only** **Stroop color only** **Trails A** WAIS-R Digit symbol
Wisconsin Card Sorting Test Trail Making Test (A&B) Controlled Oral Word Association Test	WORKING MEMORY FACTOR D2 fluctuation **LNS, # correct** **LNS, longest item passed** WAIS-R Arithmetic **WAIS-R Digit Span Backward**
(COWAT) Animal Naming Test	VERBAL LEARNING FACTOR WMS-R Verbal Paired Associates I & II WMS-R – Visual Paired Associates I & II
Ruff Figural Fluency Test (RFFT)	NON-VERBAL FUNCTIONS FACTOR WAIS-R – Block Design WAIS-R – Object Assembly WAIS-R – Picture Completion WAIS-R – Picture Arrangement **WMS-R Visual Reproduction I & II**
	IDEATIONAL FLUENCY FACTOR **RFFT–Unique Designs** **COWAT** **Animal Naming**
	Additional Executive Functioning Variables **WCST Perseverative Errors** **Stroop Interference** **(Trails A – Trails B) / Trails A**

Table 8 presents a list of tests included in an iterative series of PCAs. This iterative approach is unique because the a priori subdomains were chosen as a result of the recent schizophrenia literature and validated with data from a longitudinal study (156 participants) involving repeated NP testing (baseline-within six months of hospital and

discharge-six and eighteen months later) rather than from the traditional method where NP domains were derived by using domains delineated from studies of individuals with focal head injury. The iterative PCA methodology revealed six stable factors having good construct, divergent and predictive validity. These factors were Attention, Working Memory, Learning, Verbal Knowledge, Non-Verbal Functions, and Ideational Fluency. Distinct factors for Executive Functioning, Verbal Memory and Motor functions could not be validated based upon the measures included in the study. Three widely used measures in schizophrenia research (Stroop interference, WCST Perseverative Errors and Trails A-Trails B/ Trails A) could not be reliably combined with any of the factors computed or with one another in the PCA. The authors of the paper therefore concluded the need to examine them separately.

Since the NP battery administered in the current study employs only a subset of the measures included in the above-derived factors, factor scores could not be calculated in this study. Therefore, the two highest loading NP Test Variables for each factor were examined. Stroop interference, WCST Perseverative Errors and Trails A-Trails B/ Trails A were examined separately in this paper (Jaeger, Czobor & Berns 2003.) Two measures of Verbal Memory, CVLT Trials 1-5 and CVLT Long Delay Free Recall (tests not included for analysis in the PCA) were chosen a priori for presentation in this paper as a result of a review of the literature, since no stable factor of verbal memory was found in the PCA.

Interviews

Psychopathology: The Brief Psychiatric Rating Scale (BPRS (Overall& Gorham, 1988)) is the most widely used measure of psychopathology in the schizophrenia

literature (Hafkenscheid, 1991). The BPRS ratings were extracted from a larger scale, the Positive and Negative Symptom Scale (PANSS). The interview was conducted using the Structured Clinical Interview of The Positive and Negative Symptom Scale (SCI-PANSS (Kay, Fiszbein, & Opler, 1987), a semi-structured clinical interview designed to optimize the reliability of ratings of psychopathology in patients with schizophrenia and schizoaffective disorder. In the BPRS, eighteen signs and symptoms are rated on a scale from one to seven (1=not present, 2=very mild, 3=mild, 4=moderate, 5=moderately severe, 6=severe, 7=extremely severe). BPRS factor scores derived by Guy (1976) were used in the analyses. These factors were computed as follows: The Anxiety Depression Factor consists of ratings of somatic concern, anxiety, guilt and depressive mood. The Anergia Factor consists of ratings of emotional withdrawal, blunted affect and motor retardation. The Thought Disturbance Factor consists of ratings of conceptual disorganization, grandiosity, hallucinations and unusual thought content. The Activation Factor consists of ratings of tension, excitement and mannerisms/posturing. The Hostility Factor consists of ratings of hostility, uncooperativeness and suspiciousness.

Program/ Group Satisfaction Measures: A Program/Group satisfaction questionnaire was developed based on existing questionnaires already used at Day Hospital. This questionnaire was designed to elicit information regarding the participant's reasons for program/group absences as well as support available to assist the participant with their treatment program.

Assistive Device Measures: Participants were asked to complete a brief questionnaire regarding any difficulties using the electronic assistive device

Self Report Measures

Measures of Support: The Urging Subscale of The Involvement Evaluation Questionnaire (van Wijngaarden et al., 2000) was included in the battery to account for any involvement from family or Day Hospital staff in the participant's participation in Day Hospital. The measure includes eight self-report items asking participants how often somebody has to encourage them to perform various activities. Seven additional items were developed geared specifically toward Day Hospital activities.

Measures of Subjective Cognitive Impairment: The Patient Assessment of Own Functioning Inventory (PAOFI) (Chelune, Heaton, & Lehman, 1986) was included as a self report questionnaire evaluating participants' subjective assessment of their own functioning in various domains including memory, language and communication and higher level cognitive and intellectual functions. In this self-report measure, participants were asked questions regarding how often they have difficulty performing certain tasks that reflect these functional domains.

The PROMS Memory Questionnaire (Sohlberg et al., 1986) was included as a measure of the participant's subjective experience of their memory deficits. The scale includes 30 self-report questions asking participants how often they forget to perform tasks, such as taking their medication and how often they forget basic information like a person's name or a birth date. The scale also includes 16 questions asking participants about strategies that they utilize to help them remember.

Training

Upon the completion of the NP tests, functional interviews and self-report measures, the participants began the training phase of the study. During the training

phase, participants were taught to use each of the functions of the pager (E.G., read, reply, delete pages). Training was conducted in a stepwise fashion as documented in the Development and Pilot Testing of Training Materials above.

Experimental Treatment

During the experimental phase, the participants were paged for 80% of their groups and the other 20% of the groups served as non-paged "probe" groups. Eighty percent of the groups were chosen to serve as paged groups so that the participant would receive a large number of pages, still allowing a sufficient number of groups to serve as non-paged probe groups. The non-paged probe groups were included to assess the generalizability of the treatment to unpaged groups that were conducted on the same day. Each occurrence of each scheduled group consistently served as either a paged or unpaged group.

To determine which groups served as paged and unpaged groups, a participants' scheduled program groups were classified into high, low and zero compliance groups from the initial baseline data. Groups that were attended by a participant between 20% and 69% of the time were classified as low attendance groups; groups that were attended 70-100% of the time were classified as high attendance groups and groups that the participant never attended were considered zero attendance groups. Unpaged groups were chosen from low attendance groups (20%-69% attendance) to leave room for improvement and prevent possible ceiling effects during the treatment phase.

Development of Paging Schedule

Pages for Attending DH. All participants in the study were sent daily reminders designed to help them arrive at DH on time. This was determined as a result of the 20

patient sampling project described above, which demonstrated that the majority of participants who attend 20-70% of scheduled groups attended DH less than 75% of the time. To improve Arrival to DH participants received two pages prior to their arrival at DH. First, 45 minutes before they were to arrive at the DH they received the following page: "Good Morning Bob, it is time for you to get up you have 45 minutes to get ready for Day Hospital." Second they received a page 5 minutes before they had to leave to get to DH on time "You have 5 minutes until you have to leave for Day Hospital, don't forget to bring your pager." The time and content of the early morning pages was developed in conjunction with the participant using the Baseline Pager Interview (see Appendix I)

Pages for Attending Groups. Each patient in DH is scheduled to attend three to five groups a day, five days per week. These groups can consist of counseling groups, psychoeducation groups and rehabilitation groups. The rehabilitation groups include clerical and computer groups, where patients learn basic computer skills, commissary groups, where the patients prepare and sell food items to other patients, "boutique," where patients organize and sell used clothing items to other patients, and greenhouse, where patients water and care for plants.

The first group of the day was always paged to increase the likelihood that the participants would attend the first group of the day and begin the day engaged in their treatment. The pages for each of the participants scheduled groups were kept consistent across participants and consisted of the name of the group, the location of the group and the name of the group leader e.g., "It is time for your Physical Activity Group, with Mr. Smith in Room 133." At the end of each page the participant was prompted to respond to

the message, using the EAD's reply feature. At the end of each message the participant was asked if they understood the message and reminded to respond, "Did you understand the message? Please Respond. Yes or No." Participants also received a page at the end of each day reminding them to delete the day's messages so the mailbox does not get to full e.g. "It is time for you to delete your days messages. Use your directions sheet if you need any help." Every two weeks during the experimental phase the participant received a page prompting them to get a new battery for their pager from the research staff secretary. This page read, "It is time for you to get a new battery from your pager from Karen the CENORR secretary."

Reassessment

At the conclusion of the experimental phase, participants were reassessed on the BPRS, Program and Group Satisfaction, Pager Satisfaction and the Urging Subscale.

Post-Experimental Procedures

Upon the completion of the experimental phase, attendance data was collected for up to six months. No further contact with the participants was initiated once the pager was returned and the participant underwent the final assessments.

Statistical Analyses

Time series analyses utilizing MANWAL 7 (Williams and Gottman, 1982) were conducted on the group attendance of each of the experimental participants. MANWAL 7 is a computer program that implements the procedure that Gottman (1981) developed based upon the work of Mann and Wald (1943), in which standard least squares methods can be applied even in the presence of autocorrelations (Ramsey and Ramsey, 2003.) The MANNWAL7 program performs a number of regression analyses providing for least

squares estimates of slopes and intercepts for three different types of lines fitted to baseline and intervention conditions in a time series analysis. These analyses also provide estimates of other parameters such as a specified number of autocorrelations.

Autocorrelations occur in single subject data when two observations are similar to each other because they are in close proximity to one another. Each estimated statistic can be divided by its standard error to produce a t statistic. Every parameter that is estimated reduces the error df by at least one. Autocorrelation estimates reduce the error df by two. The P value of all statistical analyses were set to .01 to control for increased probability of Type 1 errors due to multiple comparisons. Multiple comparisons are necessary for the current data as the analysis were repeated for each of the participants. The following section contains the Group Attendance data for Experimental participants PR, RI, GD, LF, RC AM.

RESULTS

Attendance Data

Figure 1. Average group attendance data for study participants (n=6) during the baseline (n=6,) experimental (n=6) and post-experimental conditions (n=5).

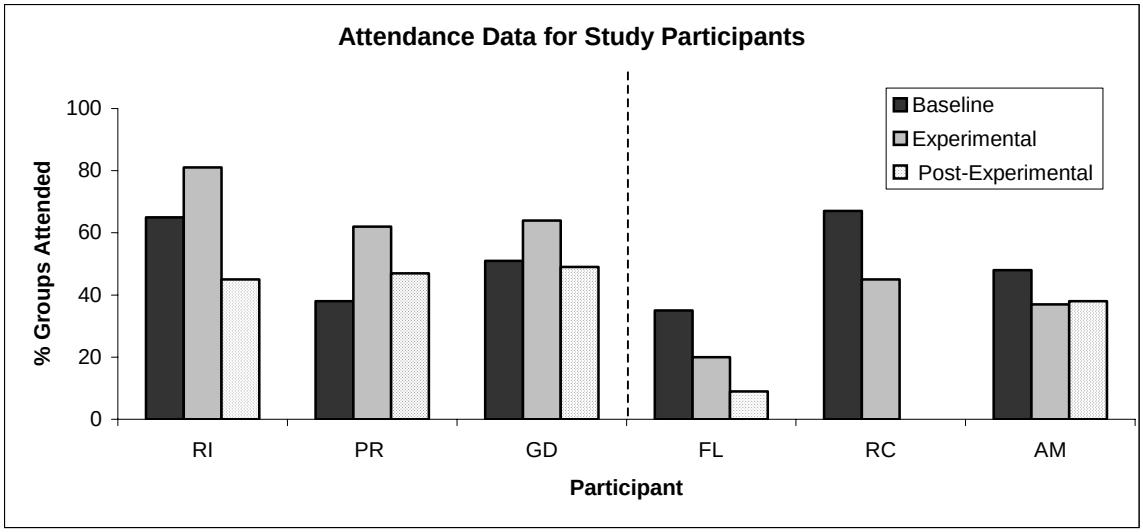


Figure 1 illustrates the average percent of groups per day for the study participants during the baseline, experimental and post-experimental phases. The responses to the experimental intervention led to the emergence of two subgroups of participants: responders and non-responders. RI, PR and GD responded to the pager treatment while LF, RC and AM were non-responders. An individual's attendance to group meetings and activities was measured by averaging across groups per day, and is referred to as "average attendance to groups".

Responders. For participant RI the average attendance to groups increased by 17% when comparing the baseline and experimental phase and then decreased by 14% when comparing the experimental and post-experimental phase. Participant RI reported to the examiner that she disliked one group leader and for that reason she did not attend those groups, therefore those groups were excluded from the analyses. PR's average attendance to groups increased by 27% when comparing the baseline period and the experimental period and then decreased by 14% when comparing the experimental to the post-experimental period. The average attendance to groups for participant GD increased by 17% when comparing the baseline and experimental period and then decreased by 15% during the post-experimental period.

Non-responders. Participant FLs average attendance to groups dropped 21% when comparing the baseline and experimental conditions and then dropped again by an additional 11% during the post-experimental period. Participant RCs average attendance to groups dropped by 19% when comparing the baseline and experimental condition. A post-experimental period was not included because participant RC was hospitalized at the end of the experimental period and did not return to the program. AM's average

attendance to groups decreased by 14% when comparing the baseline and experimental phases and then remained stable during the post-experimental phase.

To summarize, the introduction of the pager improved the average attendance to group meetings for 3 of the participants increased by 20 percent. When the pager procedure was eliminated, group attendance dropped. In contrast, the other three participants demonstrated a decline in group attendance when the procedure changed from baseline and the treatment phase and dropped again when the pager was removed. For these subjects, the pager did not produce a systematic change in group attendance.

Statistical Analysis Of Attendance Data

Table 9

Summary of Experimental Participants (n=6) Attendance to Scheduled Groups

		Baseline	**Experimental**	**Post-Experimental**
RI	Mean Percentage	65	81	45
	S.D.	47	31	32
PR	Mean Percentage	38	62	47
	S.D.	38	38	41
GD	Mean Percentage	51	64	49
	S.D.	38	38	38
FL	Mean Percentage	35	20	9
	S.D.	41	37	16
RC	Mean Percentage	67	45	**
	S.D.	31	44	**
AM	Mean Percentage	48	37	38
	S.D.	26	27	28

** Indicates Missing Data

The previous descriptive analysis showed apparent shifts in level of responding that were correlated with the presence and absence of the pager for 3 of 6 participants. Autocorrelation is sometimes seen in single subject research when there are repeated observations on a single subject, it occurs when two observations are similar to each other because they are in close proximity to one another. Traditional statistical procedures can be very misleading in the presence of autocorrelations and any researcher dealing with repeated observations in the same subject should at least consider the possibility that they exist in the data. (Ramsey and Ramsey, 2001, 2003). If autocorrelations were present in the data, traditional t-tests would not be appropriate, as the assumption that the data points are independent would be violated. In this section, then, the descriptive findings were subjected to a statistical analysis that assessed the autocorrelation of Group Attendance data, followed by a time series analysis, as described in the Statistical Analysis section of the methods.

In the current analyses, autocorrelation was assessed using a T-test at lag 1. Lag 1 examines the correlation between a data point and the data point adjacent to it. If significant autocorrelation was detected in the data, degrees of freedom in the Mann-Wald time series analysis would have to be adjusted to account for the possibility of increased Type 1 error due to the presence of autocorrelations. There was no evidence of autocorrelation for study participants at the .01 level, (RI, ($t(110) = .34$ $p = .74$); PR ($t(120) = 1.11$, $p = .27$); GD ($t(171) = 2.4$, $p = .02$; FL ($t(74) = -.56$, $p = .58$; RC ($t(33) = -.76$, $p = .46$; AM ($t(139) = 1.47$, $p = .14$). Since no significant autocorrelations were detected in the data, the degrees of freedom in the Mann-Wald time series analysis did not have to be adjusted to correct for the presence of autocorrelation in the data.

This section presents data of the Mann-Wald time series analysis. Table 9 contains a summary of the attendance data of the study participants. This analysis detects any level changes in the data. A change in level is indicated by a change in mean value from baseline to treatment that cannot be attributed to a trend effect. For example, if values are decreasing at the same rate in baseline and treatment and can be represented by a single decreasing line from baseline to treatment that would not be a level change.

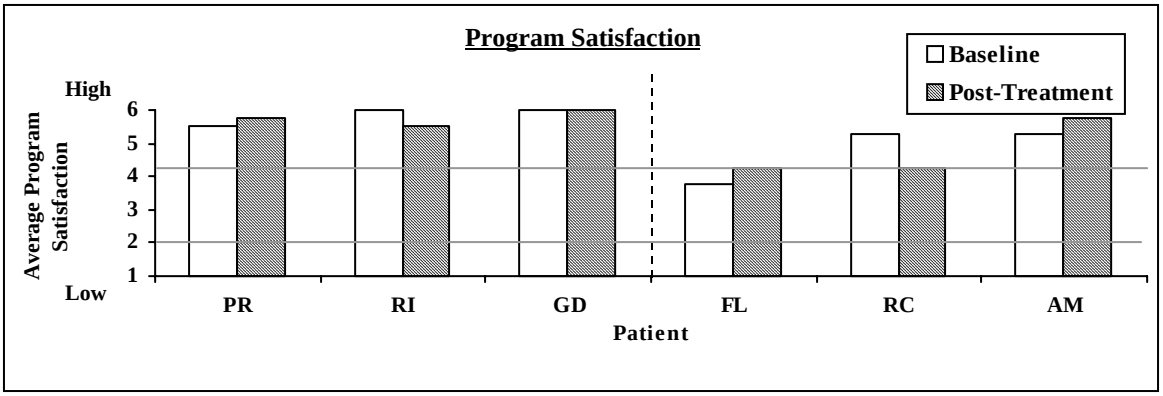
When the treatment phase was compared to the baseline and follow-up phases RI demonstrated a significant level change ($F(1,114)=12.13$, $p=.0007$.) For two other participants (PR and GD) there was an improvement in level during treatment. Although not significant, the incremental trend was in the appropriate direction (PR, ($F(1,122) =4.15$, $p=.04$) and GD,($F(1,173)=5.17$, $p=.02$). In contrast, the three non-responders (FL, RC and AM) did not demonstrate a significant level change. (AM, $F(1,141) = 0.987$, $p = 0.32$; LF, $F(1,74) = 0.08$, $p = 0.77$; CR, $F(1,33)=0.693$, $p= 0.41$).

Secondary Analyses

In addition to the primary measured described above, we also evaluated 5 categories of post hoc secondary measures that characterized the effect of training on the general psychological and cognitive status of the participants in the experiment. These measures were A) program and group satisfaction measures, B) measures of support, C) a measure of psychopathology, D) NP data, E) self reports on the patients assessment of cognition and functioning. Differences observed between the responders and the non-responders are described below.

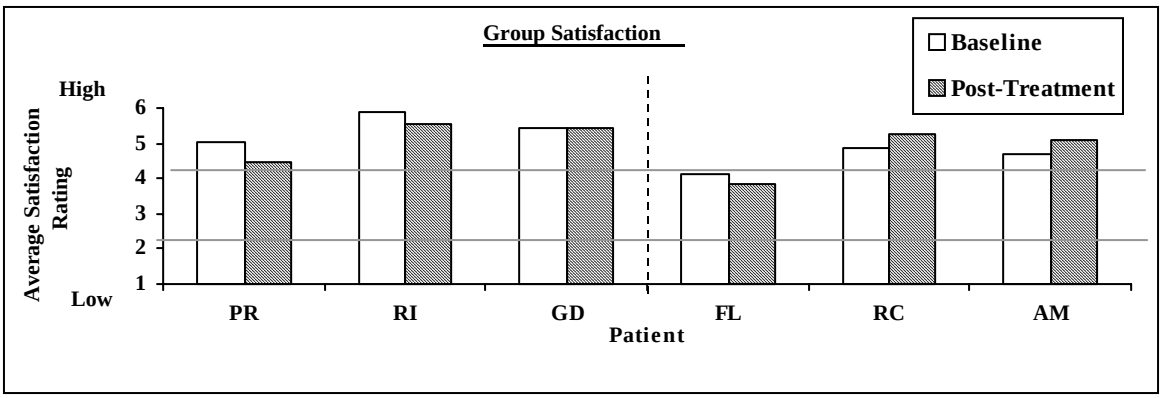
Satisfaction Measures

Figure 2. Average scores for experimental participants on the Program Satisfaction Questionnaire at baseline (n=6) and post-treatment (n=6).



Individual average satisfaction ratings for each of the participants are presented in Figure 2. At baseline the average program satisfaction of all of the responders and two of the non-responders (RC, AM) fell in the high satisfaction range (5-6). While the average program satisfaction of one of the non-responders (participant FL) fell in the medium satisfaction range (3-4). Following the treatment phase of the study the program satisfaction of all of the responders and one of the non-responders (AM) fell in the high satisfaction range (5-6). While the program satisfaction of two of the non-responders fell in the medium satisfaction range (3-4). The non-responders satisfaction during the baseline and post-experimental phases was lower than that of the responders but the difference was not significant at baseline $t(5)=.36$ or post treatment $t(5)=.34$.

Figure 3. Average scores for experimental participants on the Group Satisfaction Questionnaire at baseline (n=6) and post-treatment (n=6).



Individual average satisfaction ratings for DH groups are presented in Figure 3. The average group satisfaction of 5 of the participants at baseline fell within the high satisfaction range at baseline and post-treatment. One non-responder (participant FL) average group satisfaction fell in the mostly mixed range at baseline and post-treatment. No overall differences were observed between the responders and non-responders regarding Group Satisfaction.

Measures of Support

Figure 4. Average scores for experimental participants on the Urging Scale at baseline (n=6) and post-treatment (n=4).

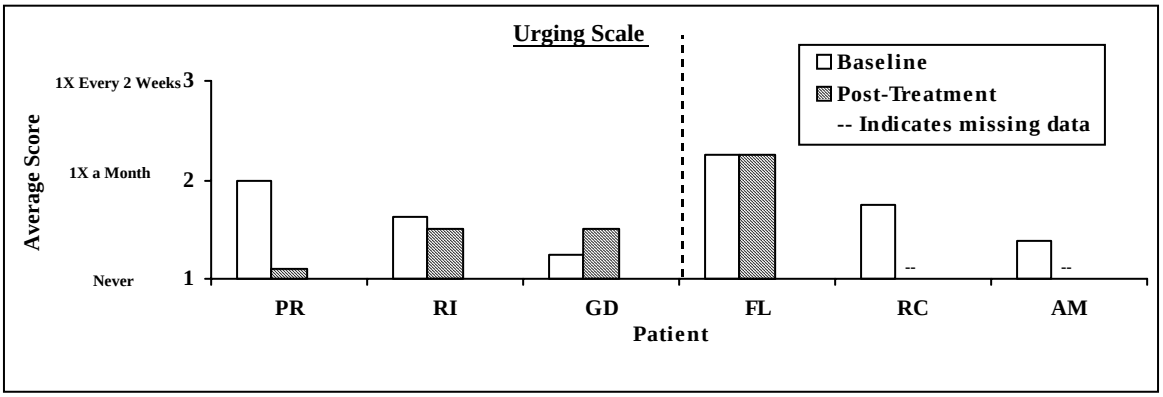
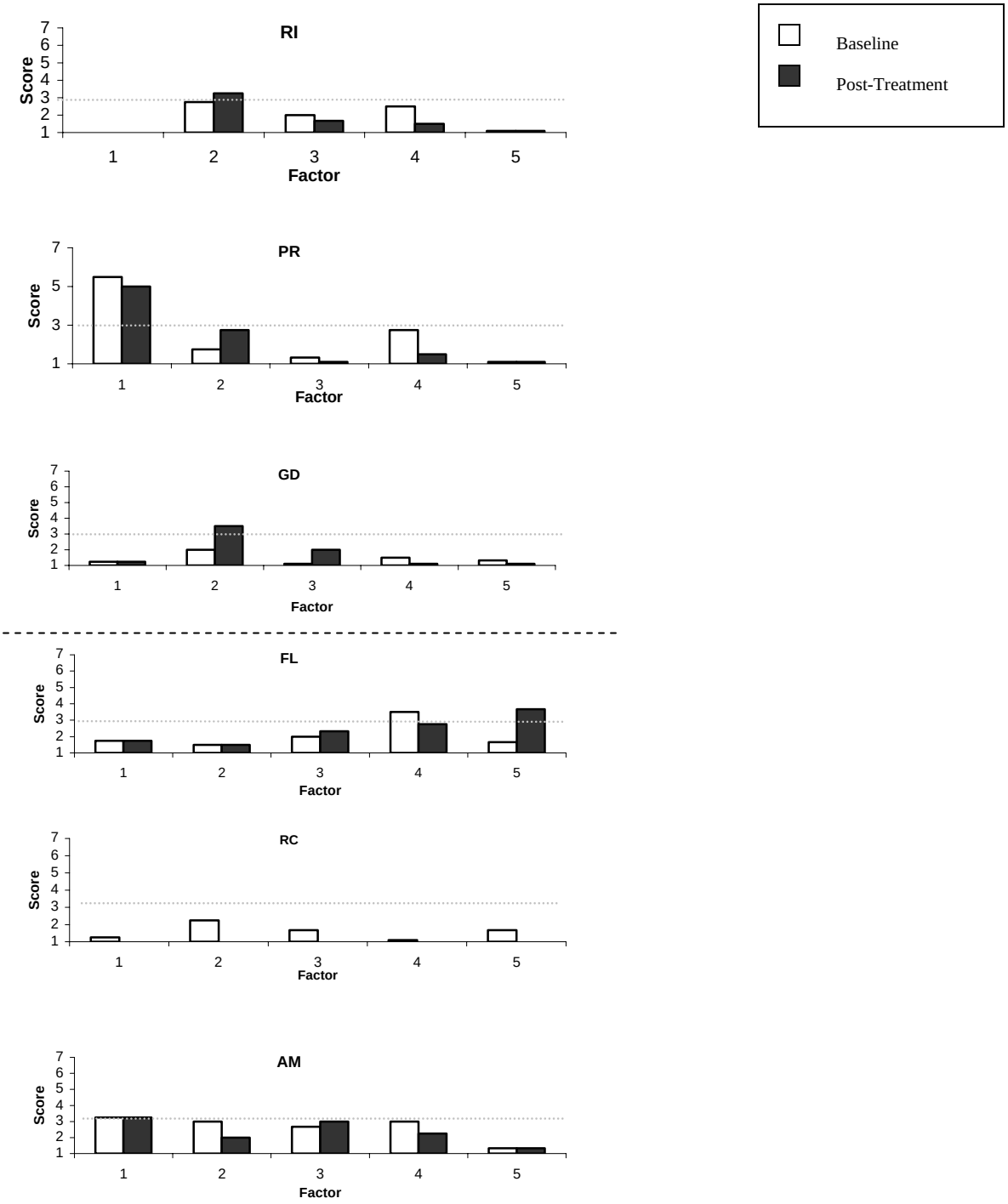


Figure 4 presents each of the participant's average scores on the Urging Scale. All of the participants reported receiving reminders from others very infrequently (in the never to 1 time a month range) during baseline and post-treatment. No differences were observed between the responders and non-responders on the Urging Scale at baseline. A comparison could not be made post-treatment due to missing data.

Psychopathology

Figure 5. BPRS Factor Scores for the participants at baseline (n =6) and post-treatment (n =5).



Note. Factor Values: 1. Thought Disturbance Factor; 2. Anergia Factor; 3. Activation Factor; 4. Anxiety-Depression Factor; 5. Hostility Factor

Figure 5 presents the BPRS factor scores of the study participants. Scores on the BPRS range from 1-7. A Score of 1 indicates the absence of a particular symptom, 2 = minimal, 3 = mild, 4 = moderate, 5 = Moderate-Severe, 6 =Severe and 7=Extreme. A reference line is drawn in each panel to indicate the mild to moderate range of symptoms.

In general, the symptoms of all of the participants were rated in the absent to mild range. When the responders were compared to non-responders, there were not systematic baseline and post-treatment differences on any of the factors. Some exceptions to these general findings were apparent. In the Thought Disorder factor (factor 1), during both the baseline and treatment phases, the score for one responder (PR) was in the moderate to severe range and the score of one non-responder (AM) was in the mild to moderate range. In the Anxiety Depression Factor (factor 4), at baseline, the scores of two of the non-responders, participants AM and FL were in the mild to moderate range and fell to the minimal to mild range post-treatment. In the Anergia Factor (factor 2), at baseline, the factor scores of all the participants fell in the absent to mild range. While upon the completion of the treatment phase, the scores of all of the responders fell in the mild to moderate range and the scores of the non-responders were in the absent to minimal range. In the BPRS Hostility Factor (factor 5), at baseline, the scores of all of the participants fell in the absent to minimal range. While during the treatment phase the scores of all the participants fell in the absent to minimal range with the exception of one non-responder (participant FL) whose score during the treatment phase fell in the mild to moderate range.

Neuropsychological Data

Table 10

NP Assessment Z-Scores At Baseline For Responders And Non-Responders

	Responders		Non-Responders	
	Individual Z-Scores	Mean Score	Individual Z-Scores	Mean Score
Trails A	PR = -0.74 RI = 0.61 GD = -0.26	**-0.13**	AM = -8 RC = -0.01 FL = 0.5	**-2.46**
WAIS Information	PR = -1.85 RI = -1.52 GD = -0.71	**-1.36**	AM = 0.59 RC = 0.43 FL = 2.06	**1.02**
Digit Span Backwards	PR = -0.58 RI = -1.07 GD = -1.07	**-0.91**	AM = -0.09 RC = 0.40 FL = 3.33	**1.21**
CVLT 1-5	PR = -0.96 RI = -1.52 GD = -2.45	**-1.64**	AM = -2.26 RC = 1.75 FL = 1.19	**0.23**
Visual Reproduction 2	PR = -1.57 RI = 0.18 GD = -0.78	**-0.72**	AM = -1.08 RC = 1.53 FL = 2.11	**0.85**
COWAT Unique Designs	PR = -1.80 RI = -1.54 GD = -0.15	**-1.16**	AM = -0.49 RC = 1.08 FL = 0.55	**0.38**
Long Delay Free Recall	PR = -1.15 RI = -1.51 GD = -0.44	**-1.03**	AM = -2.57 RC = 1.67 FL = 1.67	**0.26**
Letter Number Span	PR = -0.36 RI = -1.08 GD = -1.57	**-1.00**	AM = -1.33 RC = 0.60 FL = 1.33	**0.2**
Visual Reproduction 1	PR = -1.22 RI = 0.42 GD = -1.28	**-0.69**	AM = -2.16 RC = 1.37 FL = 1.48	**0.23**
Ruff Unique Designs	PR = -1.20 RI = -0.58 GD = -0.78	**-0.85**	AM = -1.15 RC = 0.32 FL = 0.23	**0.6**
Stroop Interference Score	PR = -0.11 RI = -0.75 GD =-0.28	**-0.38**	AM = -0.48 RC = -0.01 FL = 1.29	**0.27**
WCST Perseverative Errors	PR = 0.84 RI = -1.35 GD = 0.40	**-0.04**	AM = -1.78 RC = -0.08 FL = 0.27	**-0.53**
Stroop Colors	PR = -1.27 RI = -0.93 GD = 0.70	**-0.5**	AM = -1.96 RC = 1.73 FL = -0.46	**-0.23**
(Trails A-Trails B)/Trails A	PR = -0.97 RI = -0.74 GD = -0.79	**-0.83**	AM = -1.19 RC = -0.99 FL = -0.99	**-1.06**
Overall Mean Z-Score		**-0.8**		**+. 07**

Table 10 contains the z-scores for the NP data of the experimental participants. As indicated in Fiszdon et. al (2005), scores greater than 1 SD below the mean on any particular NP assessment indicate impairment in that particular function. The mean z-scores of the Responders (PR, RI and GD) were below the mean of the schizophrenia population on all of the NP assessments. The mean z- scores of 5 of the NP assessments were one standard deviation or more below the mean of the schizophrenia population. These assessments included measures of verbal and non-verbal memory, working memory, fluency and knowledge of real life information. The majority of the mean z-scores for the non-responders were above the mean with the exception of four assessments. The z-scores of two of the non-responders FL and CR were 1 SD above the mean on four of the NP assessments. These assessments include measures of verbal and non-verbal memory, working memory and knowledge of real life information. The z-scores of one non-responder AM were lower than those of the other participants. He scored two standard deviations or more below the mean of the schizophrenia population on 5 NP assessments. These extremely low z-scores negatively skewed the mean z-scores of the non-responders. AM's performance was especially poor on Trails A, an attention task.

Measures of Subjective Cognitive Impairment

Figure 6. Average scores for experimental participants on the PROMS Memory Questionnaire at baseline (n=6) and post-treatment (n=6).

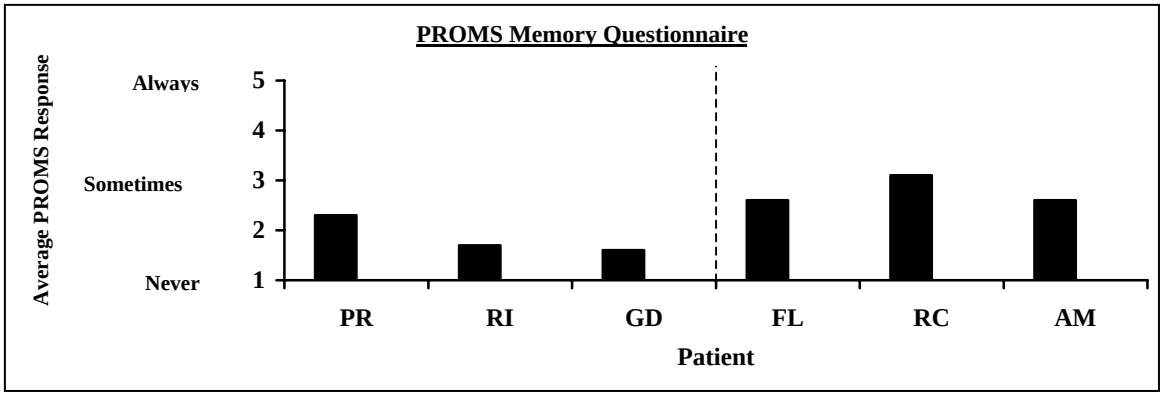


Figure 6 illustrates the individual average scores of each of the participants on the PROMS Memory Questionnaire. This is a self-report measure that assesses the participant's subjective opinion of their memory deficits. Data for the responders were on the left of the vertical line and data for the non-responders were on the left. In general, all participants reported having memory difficulties in the low range. Given this constraint, a difference was observed between the responders and non-responders $T(4) = -3.27$, $p = .03$ with the average scores responders falling in the never to almost never range and the scores for the non-responders in the almost never to sometimes range. This indicated that the responders reported having more memory difficulties than the non-responders. This difference may be attributed to the responders having more insight into their own memory difficulties than the non-responders.

Figure 7. Average scores for experimental participants on the Patient Assessment of Functioning Inventory (PAOFI) at baseline (n=6) and post-treatment (n=6).

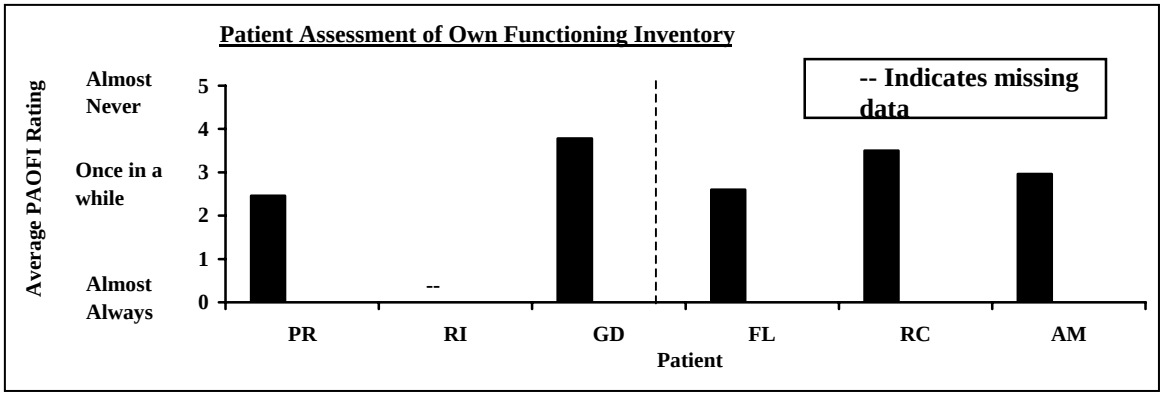


Figure 7 illustrates the individual scores of each of the participants on the PAOFI. Three of the participants, one responder and two non-responders (participants PR, AM and FL) reported having difficulties in the areas of memory, language and communication and higher level cognitive and intellectual functions in the fairly often to the once in a while range. While two of the other participants one responder and one non-responder (RC and GD) reported having difficulties in this area once in awhile to in the very infrequently range.

DISCUSSION

The Effects of Pagers on Attendance

The introduction of the pager improved the group attendance for 3 of the 6 participants in the experiment. When the pager procedure was eliminated, group attendance dropped for these subjects. In contrast, the other three participants demonstrated a decline in group attendance when comparing the baseline and the treatment phase and dropped again when the pager was removed. For these subjects, the pager did not produce a systematic change in group attendance. The 3 non-responders demonstrated a pattern of attendance that is typical of individuals that attend Day

Hospital, as documented by the data for the twenty patient sample described Table 3. For these patients, 80% demonstrated a deteriorating pattern of attendance over the course of their 4-month stay in DH.

No correlation was observed between ratings of psychopathology and participant's response to the pager. In general, all of the participants demonstrated symptoms in the absent to moderate range and their symptoms remained stable throughout the course of the study. One exception was participant PR, a treatment responder, who demonstrated symptoms of Thought Disturbance in the moderate to severe range at baseline and at the conclusion of the experimental phase. This indicates that even severely psychotic patients can benefit from the use of a cognitive prosthesis, like a pager. Another exception was participant FL who demonstrated increased symptoms of Hostility when comparing the baseline and experimental phases. Anecdotally, LF reported enjoying the pager but that his frustration at being in the program grew over the course of his stay. LF reported that over time he felt more and more that he did not belong in the program because he was more intelligent than the rest of the clients. He did not report having difficulty with any particular group or group leader. LF's experience indicates that individuals with high hostility levels may be unable to benefit from EADs like a pager. Inch, Crossley, Keegan and Thorarinson, (1997) found that of all the BPRS factors, the subscale measuring hostility and suspiciousness discriminated, at intake, clients who were therapeutically discharged from a psychosocial treatment program, and clients who did not complete the program. Fiszdon et al (2005) concluded that in addition to cognitive factors, motivational variables and patient hostility significantly affected cognitive remediation outcomes.

Another difference observed between responders and non-responders was that responders performed between 1-2 SD below the mean on the majority of NP tests, while two of the non-responders performed well above the mean and another scored 2 SD below the mean on the majority of NP tests. These findings support the hypothesis that an EAD such as a pager is an effective tool for accommodating for NP deficits, in at least a subset of individuals with schizophrenia. These are individuals whose average NP assessment scores are within 1 SD below that of the schizophrenia population on measures of verbal and non-verbal memory, working memory and verbal fluency. These findings are consistent with the handful of studies that investigated potential predictors of successful cognitive remediation training (Fiszdon, 2005; Sturm, 1997; Silverstein, 2000, Abi-Saab, Fiszdon, Bryson, Bell, 2005). These studies indicate that schizophrenia is a heterogeneous disorder and that there is a subtype of patients that benefit most from interventions targeting cognitive domains. These are patients who are in the middle of the spectrum, those who demonstrate significant impairments in the domain targeted yet whose basic components of attention, such as alertness and vigilance, are intact.

Social Validity/Clinical Significance of Treatment

Social validity examines how improvements in a behavior caused by a particular treatment are important for the participants every day lives. There are 3 components of social validity, social significance, social appropriateness and social importance (Wolf, 1978.) The social significance of the pager for participants in the current study are indicated by the 20% improvement in attendance that participant's demonstrated during the treatment period. At baseline, all of the participants demonstrated poor attendance levels. They spent the time they were not attending scheduled groups, withdrawn,

sleeping, watching television, or smoking cigarettes. All of these activities left participants at a higher risk for relapse and rehospitalization (Wright and Lunt, 1995.) During the treatment phase, participants participated in approximately 4 extra hours of meaningful group activity a week. Since the participants were more engaged in their own treatment process instead of being withdrawn and isolated. Killaspy et al. (2000) found that individuals who were not engaged in their Day Treatment programs were more "unwell," more socially impaired, had higher drop out rates from out-patient services and had a larger number of subsequent admissions to inpatient facilities than attenders.

The social appropriateness of the treatment is demonstrated by the anecdotal reports from the patients themselves and their case managers at DH indicate that the participants were better able to engage in their treatment when the pager prompted and reminded them to attend their groups. No negative feedback regarding the pager was received from the case managers of the non-responders. Anecdotally, the case managers thought that the pagers were a useful treatment but that the patients had external factors influencing their attendance.

Limitations of Current Study

One limitation of the current study was that participants were not screened for the presence of NP deficits at baseline. In the studies conducted by Wilson's group, (Hersch and Treadgold 1994; Wilson 1999; Wilson et al. 2001; Evans et al. 1998), participants were screened for cognitive deficits in the areas of attention, memory, planning and/or initiation prior to being provided with an EAD. At the inception of this study, NP norms had not been developed for the schizophrenia population and therefore cutoff scores could not be determined. Cut-off scores on NP assessments should be developed to help

clinicians and researchers to determine which patients would benefit most from using EADs like a pager.

Another limitation of this study was the lack of contact that the researchers had with the participants during the course of the treatment protocol. This was done to prevent the possible confounding effects of increased staff interaction during the treatment phase of the study. This lack of contact during the treatment phase was particularly detrimental to the performance of participant AM who demonstrated the most difficulties in mastering the use of the treatment intervention, was severely disorganized and demonstrated severe deficits in attention during NP testing. One possibility is that more severely ill patients require more support from the staff to maintain compliance with the treatment. Cuvo, Davis, O'Reilly, Mooney and Crowley (1999) assessed whether written task analyses would serve as textual prompts for performing functional tasks in young adults with mild developmental disabilities. They found that when verbal feedback was not provided, the effectiveness of written specific task analyses were inconsistent but in the presence of verbal feedback participants were able to consistently perform tasks of daily living. In addition, it may prove helpful in future studies to re-evaluate the pager competency of each of the participants periodically during the treatment phase, to ensure that patients are not having any difficulties in the use of the intervention. More impaired patients may forget how to use the treatment and may need additional training during the course of the treatment to use it effectively.

Another limitation is that individuals with non-cognitive reasons for attending groups may require more than just prompts to benefit from an electronic assistive device like a pager. These participants may require more complex behavioral interventions,

such as using a combination of prompts and reinforcement that is delivered through the pager, for the pager to be of benefit. The combination of prompts and reinforcement may also increase the effectiveness of a pager in individuals who did benefit from pager treatment. Future studies can be conducted that integrate the idea of sending both prompts and reinforcement through an EAD like a pager.

Another limitation of this study was the small sample size. Though the sample size was adequate for a within subject design using multiple observations, using a small sample size makes it difficult to generalize the results of this study to the population at large. In future studies a large, randomized controlled trial design should be utilized to determine the efficacy of this intervention in this population.

Implications For Future Research

On the basis of the success of the pager as an EAD in improving the attendance of individuals with schizophrenia who suffer cognitive deficits, future studies should be conducted to replicate the current findings. The success that the pager had in improving the attendance in a subgroup of patients and the success that Velligan et al. (1996, 2000, 2002) have demonstrated in improving the adaptive functioning in individuals with schizophrenia by modifying their environment suggest a new direction should be explored in the cognitive remediation literature. Rather than developing treatments that attempt to improve the cognition of individuals, as has been the approach taken in the majority of the cognitive remediation research, more treatments should be developed that help individuals with schizophrenia compensate for cognitive deficits in schizophrenia. Currently an NIMH funded grant is underway at CENORR investigating the ability of an EAD like a pager to improve the medication compliance of outpatients with

schizophrenia. Future research can be conducted examining the generalizability of using EADs in other environments and with different psychiatric populations. For example, EADs have the potential to improve compliance in vocational training programs, aftercare, and medical appointments. In addition, individuals with schizophrenia demonstrate difficulties in other areas of life that can be targeted by an EAD, such as activities of daily living.

APPENDIXES

Appendix A: Summary of Literature of the Use of General Stimulation Techniques and Schizophrenia

	Treatment				Outcome Measures							
Author	Pt type	Treatment type	PP/ Comp.	Targeted Mental Operation	Attention	Working Memory	Memory	General Intellectual Functioning	Executive Functions	Symptoms	Functioning	Work Behavior
Seltzer, 1997	Inpt	Group	PP	Attention	Mixed Results	No Sig. Improv.			No Sig. Improv.			
Benedict, 1990	Inpt	Indiv.	Comp.	Attention	Sig. Improv.	No Sig. Improv.	No Sig. Improv.		No Sig. Improv.			
Spitzer, 1995	Inpt	Indiv.	Comp.	Attention	Mixed Results							
Medalia, 1998	Inpt	Indiv.	Comp.	Attention	Sig. Improv.					Sig. Improv.		
Field, 1997	Outpt	Indiv.	Comp.	Attention	No Sig. Improv.				No Sig. Improv.			
Benedict, 1994	Outpt	Indiv.	Comp.	Attention	No Sig. Improv.	No Sig. Improv.	No Sig. Improv.					
Kurtz, 2001	Outpt	Indiv.	PP	Attention and Prospective Memory Training	Mixed Results	No Sig. Improv.			No Sig. Improv.			
Medalia, 2000	Inpt	Indiv.	Comp.	1) Memory 2) Problem Solving			No Sig. Improv.					
Medalia, 2001	Inpt	Indiv.	Comp.	1) Memory 2) Problem Solving			No Sig. Improv.				Sig. Improv.	
Wykes, 2002	Outpt	Group and Indiv.	PP	Executive Functions = Combination of: - Cognitive Flexibility - Planning - Memory - Working Memory		Sig. Improv.	Sig. Improv.		Mixed Results			
Wykes, 1999	Outpt	Indiv.	PP	Executive Functions = Combination of: - Cognitive Flexibility - Planning - Memory - Working Memory	Sig. Improv.	Sig. Improv.			Sig. Improv.	No Sig. Improv.	No Sig. Improv.	
Medalia, 2000	Inpt	Indiv.	PP	Problem Solving					Mixed Results	Sig. Improv.		
Burda, 1994	Inpt	Indiv.	Comp.	Not Specified	Sig. Improv.		Sig. Improv.	No Sig. Improv.	Sig. Improv.			
Ahmed, 1994	Outpt	Group	PP	Not Specified				Mixed Results			Mixed Results	

Appendix B: Summary of Literature using the Comprehensive Approach in Schizophrenia

				Treatment						Outcome Measures	
Author	**Pt Type**	**Tx Type**	**PP/ Comp**	**Targeted Mental Operation**	**Attn**	**Working Memory**	**Mem**	**General Intellectual Functioning**	**Exec Fx**	**Sx**	**Fx**
Spaulding, 1999	Inpt	Group	PP	Executive Functions -Social Perception - Communication Skills -Interpersonal Problem Solving -Social Skills Training.	Sig. Improv	No Sig. Improv	No Sig. Improv		No Sig. Improv	No Sig. Improv	No Sig. Improv.
Bell, 2001	Inpt	Group and Indiv.	PP and Comp	1) Attn 2) Memory 3) Exec Functions 4) Work Therapy	No Sig. Improv	Sig. Improv	No Sig. Improv		Sig. Improv	No Sig. Improv.	
Cassidy, 1996	Outpt	Indiv.	Comp. and PP	1) Attn 2) Mem 3) Cog Flex	Mixed Results	Sig. Improv					
Penades, 2000	Outpt	Group	PP	Executive Functions -Cognitive Differentiation -Social Perception	Mixed Results	Mixed Results	Mixed Results	Mixed Results	Mixed Results		

Appendix C: Average Percentage Weekly Attendance to Group for 20 Patient Sample.

Patient	Wk 1	Wk 2	Wk 3	Wk 4	Wk 5	Wk 6	Wk 7	Wk 8	Wk 9	Wk 10	Wk 11	Wk 12	Wk 13	Wk 14	Wk 15	Wk 16
1	70	45	64	31	54	74	43	67	25	26	16	17	19			
2	63	34	16	12	16	21										
3	55	40	45	22	40	47	20	15	13	10	5	15	10	0	0	0
4	64	92	96	92	76	70	93	84	20	55	75					
5	37	40	12	18	18	16	12	20	25	15	20	16	20	8	25	17
6	23	55	50	62	64	70	27	65	60	60	68	61	27	57		
7	19	15	66	71	66	63	88	38	0	80	69	33				
8	38	38	48	28	25	25	10	20	63	63	71	44	60	61	78	75
9	83	75	71	59	81	69	54	24	59	51	40	22	49	52	57	74
10	61	62	67	57	54	59	47	49	25	15	67	39	20	56	44	79
11	42	8	40	53	55	46	15	49	44	16	45	38	29	56	51	24
12	54	43	0	0	42	24	36	40	35	63	29	53	66	20	33	48
13	42	80	35	58	75	62	58	42	65	45	72	85	75	79	81	82
14	18	49	64	42	52	37	65	66	58	18	43	20	17	17	27	22
15	68	5	49	34	22	41	74	27	75	12	56	32	28	34	36	33
16	60	58	43	38	81	54	54	66	57	97	48	39	36	40	60	20
17	67	76	65	76	71	65	76	60	22	20	25	38	23	18	7	10
18	36	42	42	30	37	10	7	22	38	57	0	27	40	56	56	50
19	69	57	48	52	48	70	44	73	85	40	87	76	76	75	92	60
20	58	45	96	76	73	54										

Appendix D: Electronic Assistive Device

Appendix E: Screening Form

RECRUITING FOR PAGER PROJECT **DATE _____**
Patient Name _____ Admit date to DH _____
Projected start date_____
Birthdate _____ Race _____ Sex: M□ F□ Marital Status _____
Hospital I.D _____ Total years of education _____ Highest degree obtained _____

Inclusion Criteria: Diagnosis

Schizophrenia	□
Schizoaffective Dis	□
Major Depressive Dis.	□
Bipolar Disorder	□

		Y	**N**	
Exclusion Criteria:	Fluent in English	□	□	
	ECT within past 2 months	□	□	If yes, most recent _____
	MR	□	□	
	Primary Neurological impair	□	□	

Diagnosis_____ Chart review done:Y□ N□
Details from chart
_____

Does research have to be consulted? Y□ N□ If yes, was research contacted? Y□ N□ Can we contact patient? Y□ N□
Case Manager _____Contacted: Y□ N□
Notes_____
Date can approach _____Who should be contacted (family/home)? _____
Contact information from chart _____
Referral info.
_____
Source of Information:(circle all relevant info.) Day Hospital Chart Patient Clinician Other
IN STUDY: Y□ N□ Baseline Date
_____
REFUSED: Y□ N□ Reason Refused
_____

Attendance

	Date	Attendance	Date	Attendance	Date	Attendance	Date	Attendance
Week 1								
Week 2								
Week 3								
Week 4								
Week 5								
Week 6								
Week 7								

Meets Criteria: Y N Average attendance bet. 20-60%
Percentage of groups weeks 2-3: _____ Percentage wk 2-4: _____ Percentage wk 2-5: _____ Percentage wk 2-6: _____

Screening Question: Are there any groups that you feel very strongly about not attending? _____

Appendix F: Informed Consent Form

North Shore-Long Island Jewish Health System-Hillside Hospital
Informed Consent to Participate in:
Evaluation of an Electronic Assistive Device for Psychiatric Rehabilitation (Pilot Sub-study)

Investigators:
Principal Investigator: Stefanie Berns, Ph.D.
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Introduction:

Many people with mental illness have trouble remembering to do things such as take their medicine or go to appointments. You are being asked to participate in a research study to find out whether or not using a pager may help you remember to do these kinds of things. To do this, you will be given a pager and you will be sent reminders throughout the day reminding you to do different things related to your participation in your day treatment program.

Purpose of this Project:

This research project aims to evaluate the benefits of using a device like a pager to help individuals with mental illness participate better and benefit from their treatment program.

Expected Duration of the Participants Participation:

If you agree to take part in this study, we will need to see you for the first visit for approximately two hours where we will administer a number of assessments and teach you how to use the pager. You will also be asked to meet with the research staff at least every two weeks for approximately twenty minutes, for up to three months, to complete some brief questionnaires regarding your use of the pager, adherence to your treatment plan and any symptoms you may have been experiencing in the past week. In addition, if you or the experimenter has any problems or concerns regarding the pager or any other aspect of the study between scheduled appointments, additional meeting times will be scheduled, as needed.

Description of Procedures:

If you agree to take part in this study, you will be administered pencil and paper tests that assess skills such as memory, attention and problem-solving. During some of these tests you will be timed. You also will be asked questions about any symptoms you may have experienced during the past week as well as questions about the medications you take and treatment you receive. These assessments take approximately 90 minutes and if you become tired you may ask for a break or request that it be continued on another day. You will also be instructed in how to use the pager and you will also work with the research staff to program your pager with a series of individualized reminders. At the

designated times, the device will vibrate and/or beep to prompt you to read the reminders. You will also have follow-up visits on a regular basis (at least every two weeks or as needed) for up to three months with the research staff to update these reminders and help you with any difficulty you may be having with the device. If after training you are unable to learn how to use the pager or you consistently do not use the pager, your participation in the study will end at that time.

To help us make sure that we correctly write down the information you provide, it can be very useful to us if we videotape or audiotape portions of the sessions. Your name will not be on the tape and it will be kept in a locked file cabinet. Only staff involved in this project would have access to the tape. If you choose not to be taped, you can still participate in the study and no portion will be taped. Please initial below if you do **not** want to be audio- or video-taped.

_____I do **not** want to be audio-taped. _____I do **not** want to be video-taped.

Confidentiality:

If you agree, information from clinical interviews may be shared with your treatment team. Please initial below if you do **not** want such information shared with your treatment team.

_____ I do **not** want information shared with my treatment team.

However, if in the course of this research, information relevant to your protection or the protection of others is learned, it will be released to your treatment team.

Your identity and participation are confidential to the extent permitted by law. Your test results will not be identified with your name, but by a number code to maintain your confidentiality and all results will be stored in locked areas.

Release of Information:

Any other information about you obtained from this research including answers to questionnaires, history, or audio or videotapes will be kept confidential.

Possible Discomforts and/or Risks:

Potential risks of participating in this study are extremely minimal but may include fatigue and test anxiety. You may also feel annoyed or possible embarrassed by the reminders while using the electronic assistive device.

Possible Benefits of Participation:

There may be no direct benefit to your participation. However, your participation in this study will help us learn whether an electronic assistive device is a useful rehabilitation tool for people with mental illness.

Alternative Treatment

Although this study does not involve a treatment, you have the alternative of not taking part in the study and continuing without affecting your care.

Voluntary Participation

Your decision to participate is voluntary. If you decide not to participate or if you choose to withdraw after beginning the study, you will not lose any benefits associated with your medical care.

Costs

There will be no costs to you for your participation in this study.

Compensation for Injury

In accordance with Federal Regulations, we are obliged to inform you about the North Shore-Long Island Jewish Health System policy in the event physical injury occurs. If, as a result of your participation you experience physical injury from known or unknown risks of the research procedures as described, immediate medical care and treatment, including hospitalization, if necessary, will be available. No monetary compensation, however, is available and you will be responsible for the costs of such medical treatment, either, directly or through your medical insurance and/or other forms of medical coverage.

Contact Questions

You are encouraged to ask questions before deciding whether you wish to participate and any time during the course of the project by contacting Stefanie Berns at 718-470-8436. For questions concerning this research project and/or research participants' rights, you should call the Office of the Institutional Review Board at 516-719-3100. The IRB is the committee that oversees research at this institution.

A copy of this consent will be given to you.

INFORMED CONSENT QUESTIONNAIRE

It is important that you understand the contents of this consent form. Below are some true/false questions about the consent form.

Circle One:

True False 1. Participating in this study requires a change in my medication.
True False 2. I can ask to take a break at any time.
True False 3. Once I agree to participate I can't change my mind.
True False 4. Results of the tests are kept confidential.
True False 5. I can choose not to be video- or audio-taped.
True False 6. I will be asked to return for follow-up assessments.

I agree to participate in this research study.

Subject's Name (print)	Witness Signature (someone with no connection to this research project)
Subject's Signature	Witness Identification (e.g. nurse, friend, receptionist, etc.)
Date	Date

I have offered an opportunity for further explanation of the risks and discomforts that are, or may be associated with this study and to answer any further questions relating to it. I also verify the subject's ability to provide informed consent:

Signature of clinician obtaining consent	Date

Appendix G: Training Manual

What the Symbols on the Pager Mean

The GREEN check mark in the lower right hand corner = ENTER or SELECT

The UP ARROW in the upper right hand corner = SCROLL UP- Pressing this key will move the highlighted area UP

The DOWN ARROW in the upper right hand corner = SCROLL DOWN- Pressing this key will move the highlighted area DOWN

The YELLOW BENT UP ARROW in the lower left hand corner = GO BACK TO THE LAST MENU – Pressing this key will return you to the last thing you were looking at.

How to Answer Your Pages

Press the GREEN CHECK MARK 2 times. This should bring you to your newest message.
Then press the DOWN ARROW until you have read the **Entire** message.

If You Have Difficulty Reading Your Messages Using the First Method

1) Press the YELLOW BENT UP ARROW one time.
2) Press the UP ARROW button until you cannot go any higher.

Press the GREEN CHECK MARK button 1 time. This should bring you to your newest
message.
Press the DOWN ARROW until you have read the **Entire** message.

****If you ever end up in a screen you are not familiar with Press the YELLOW BENT UP ARROW until you see something that is familiar to you.**

Reply pager training - What the Symbols on the Pager Mean

The GREEN check mark in the lower right hand corner = ENTER or SELECT

The UP ARROW in the upper right hand corner = SCROLL UP- Pressing this key will move the highlighted area UP

The DOWN ARROW in the upper right hand corner = SCROLL DOWN- Pressing this key will move the highlighted area DOWN

The YELLOW BENT UP ARROW in the lower left hand corner = GO BACK TO THE LAST MENU – Pressing this key will return you to the last thing you were looking at.

If You Are Asked to Reply to a Message

When you finish reading your message, Press the GREEN CHECK MARK 1 time to reach the bottom of the screen where it says Next/Reply/Delete.
Press the GREEN CHECK MARK 1 time.
Press the DOWN ARROW KEY until you highlight the Reply to Message choice.
Press the GREEN CHECK MARK 1 time to select the Reply to Message choice.
Use the UP or DOWN ARROW until you highlight the desired response.
Press the GREEN CHECK MARK button 1 time, to send your response.
The screen will say Message Transmitting after you send your response.

****If you ever end up in a screen you are not familiar with Press the YELLOW BENT UP ARROW until you see something that is familiar to you.**

What the Symbols on the Pager Mean

The GREEN check mark in the lower right hand corner = ENTER or SELECT. Use this button to go to the next section and register any items you highlight.

The UP ARROW in the upper right hand corner = SCROLL UP- Pressing this key will move the highlighted area UP. Use this button to move the highlighted area up within a message or a menu.

The DOWN ARROW in the upper right hand corner = SCROLL DOWN- Pressing this key will move the highlighted area DOWN. Use this button to move the highlighted area down within a message or a menu.

The YELLOW BENT UP ARROW in the lower left hand corner = GO BACK TO THE LAST MENU – Pressing this key will return you to the last thing you were looking at. Use this button if you make a mistake and go to far and you would like to return to the last thing you were looking at.

How to Delete Pages

1) At the end of the day, as part of your final page for the day you will be prompted to delete all the day's messages, answer the message and read it as usual.
2) To delete messages, Press the YELLOW BENT UP ARROW 2 times to reach the Main Menu.
3) Press the DOWN ARROW KEY 4 times and highlight Delete Messages.
4) Press the GREEN CHECK MARK 1 time.
5) The pager will ask you if you would like to Delete All Read Inbox Messages and the Yes response will be highlighted.
6) Press the GREEN CHECK MARK 1 time to delete messages.

****If you ever end up in a screen you are not familiar with Press the YELLOW BENT UP ARROW until you see something that is familiar to you.**

Appendix H: Training Log

Phase 1: Pager Basics

- At the first session show subject first instruction sheet, teach the meaning of each of the pager keys and show subject how to answer pages

- At the next session review with subject all taught at the first session, at the end of second session ask subject following questions and rate their ability to perform tasks 1-3. If cannot answer all questions and perform all tasks correctly review instructions with subject again and repeat administration of questions at the next appointment

- When subject is able to answer all questions correctly and perform all tasks correctly move on to phase 2.

Time 1:
What does green check mark mean? _____ (return or enter)
When would you use it?_____(answer messages, to go onto to the next screen)
What does the up arrow do? _____ (can move highlighted area up)
When would you use it?_____(When you want to move up in a menu or in a message)
What does the down arrow do? _____ (can move highlighted area down)
When would you use it? _____(When you want to go down in a menu or read a complete message)
What does the yellow backwards arrow do? _____ (bring you back to the last thing you were working on) When would you use it?_____(When you make a mistake or go to far and you want to go back)

1. Can the subject identify the buttons correctly? Y□ N□
2. Can the subject press the buttons correctly? Y□ N□
3. Can the subject verbally describe how to answer pages and demonstrate it? Y□ N□

Time 2:
What does green check mark mean? _____ (return or enter)
When would you use it?_____(answer messages, to go onto to the next screen)
What does the up arrow do? _____ (can move highlighted area up)
When would you use it?_____(When you want to move up in a menu or in a message)
What does the down arrow do? _____ (can move highlighted area down)
When would you use it? _____(When you want to go down in a menu or read a complete message)
What does the yellow backwards arrow do? _____ (bring you back to the last thing you were working on) When would you use it?_____(When you make a mistake or go to far and you want to go back)

1. Can the subject identify the buttons correctly? Y□ N□
2. Can the subject press the buttons correctly? Y□ N□
3. Can the subject verbally describe how to answer pages and demonstrate it? Y□ N□

Time 3:

What does green check mark mean? _____ (return or enter)
When would you use it?_____(answer messages, to go onto to the next screen)
What does the up arrow do? _____ (can move highlighted area up)
When would you use it?_____(When you want to move up in a menu or in a message)
What does the down arrow do? _____ (can move highlighted area down)
When would you use it? _____(When you want to go down in a menu or read a complete message)
What does the yellow backwards arrow do? _____ (bring you back to the last thing you were working on) When would you use it?_____(When you make a mistake or go to far and you want to go back)

1. Can the subject identify the buttons correctly? Y□ N□
2. Can the subject press the buttons correctly? Y□ N□
3. Can the subject verbally describe how to answer pages and demonstrate it? Y□ N□

Phase 2: Reading Messages

Once subject successful at above tasks, assess if subject s can answer pages unassisted correctly. Subject must answer the pages independently and read them aloud to you. Make sure that the subject knows to scroll down to read the complete message before continuing. When subject successfully and independently answers 5 consecutive pages, teach the subject how to use the REPLY feature using the Pager Training Instructions Sheet. If the subject demonstrates any difficulty pressing the buttons correctly after going through 10 pages, teach the alternate training version.

	Answered Correctly
1. Good Morning (afternoon) XXX, have a nice day.	Y☐ N☐
2. The weather outside is (XXX) today.	Y☐ N☐
3. Today I am going to teach you how to use the pager.	Y☐ N☐
4. Good morning (afternoon) XXX, I hope you enjoy working with the pager.	Y☐ N☐
5. Good Morning (afternoon) XXX, today I am going to teach you more about working with the pager I hope that you like it.	Y☐ N☐
6. It is very warm in this office today.	Y☐ N☐
7. The black cat sat on a hat.	Y☐ N☐
8. It has been great working with you today. I hope you are learning a lot about using the pager.	Y☐ N☐
9. There are two chairs, a desk and a computer in this room.	Y☐ N☐
10. CENORR offices are located on the first floor and in the basement.	Y☐ N☐
11 Working with you on the pager is a very enjoyable experience.	Y☐ N☐
12. Day Hospital is open from 9:30 until 3:00.	Y☐ N☐
13. If I want to see the Day Hospital secretary I have to go upstairs to the Day Hospital Offices.	Y☐ N☐
14. Lunch hour in Day Hospital is at 12:30.	Y☐ N☐
15. It has been really great teaching you how to use the pager I hope you enjoy it as much as I did.	Y☐ N☐

Phase 3: Replying to Messages

Review with subject what the buttons on the pager mean and how to use Reply feature using the Pager Training Instructions Sheet, when think subject understands how to use the Reply feature, begin sending the following pages with a Yes/No reply.
To add yes/no reply type: #Yes - enter. #No - enter. ## - enter. Make it clear that from now on you want them to reply to every message they receive. When subject successfully and independently answers and replies to 5 consecutive pages, teach the subject how to Delete their pages using the Pager Training Instructions Sheet and tell them during the experimental condition that they will be asked to do this on a daily basis.

	Answered Correctly	**Replied Correctly**
1. Is this Sara's office?	Y□ N□	Y□ N□
2. Are there 4 chairs in this office?	Y□ N□	Y□ N□
3. Is the carpet in my office red?	Y□ N□	Y□ N□
4. Am I wearing a skirt?	Y□ N□	Y□ N□
5. Is there a window in this office?	Y□ N□	Y□ N□
6. Is today Monday?	Y□ N□	Y□ N□
7. Is tomorrow Thanksgiving?	Y□ N□	Y□ N□
8. Is tomorrow Thursday?	Y□ N□	Y□ N□
9. Was Yesterday the Fourth of July?	Y□ N□	Y□ N□
10. Is it cold outside today?	Y□ N□	Y□ N□
11. Is it winter?	Y□ N□	Y□ N□
12. Is there a bulletin board in this room?	Y□ N□	Y□ N□
13. Is there a desk in this room?	Y□ N□	Y□ N□
14. Is there a filing cabinet in this room?	Y□ N□	Y□ N□
15. Is it warm outside today?	Y□ N□	Y□ N□
16. Is it summer?	Y□ N□	Y□ N□
17. Was Yesterday Monday?	Y□ N□	Y□ N□
18. Are there bookshelves in this room?	Y□ N□	Y□ N□
19. Are the chairs in this room blue?	Y□ N□	Y□ N□
20. Are the walls in this room pink?	Y□ N□	Y□ N□

Phase 4: Deleting Messages

Review with subject what the buttons on the pager mean, how to use Reply feature using the Pager Training Instructions Sheet how to delete pages using the Pager Training Instructions Sheet. If confident subject learned how to delete pages send subject a page to prompting them to delete their pages and reminding them to use the Pager Training Instructions sheet. The page should say - **"It's time to delete the days messages. Use your pager manual if you need any help to do this."**
When subject successfully and independently deletes 5 consecutive pages can continue to Non-group related activities or pager efficacy phase.

Deleted correctly:
1. Y□ N□
2. Y□ N□
3. Y□ N□
4. Y□ N□
5. Y□ N□
6. Y□ N□
7. Y□ N□
8. Y□ N□
9. Y□ N□
10. Y□ N□

NON-GROUP RELATED ACTIVITIES TRAINING LOG

SAY TO PATIENT*: In a few minutes I will be sending you some pages to your beeper, you should have a seat in the lounge or Commissary until your pager goes off. In these pages I will be asking you to complete particular tasks. When the pager goes off (vibrates or buzzes) I want you to respond to the page, read the page completely, reply to the page and carry out the task the page asks you to do.*

Schedule the first nine pages. Leaving sufficient time for each task to be completed. Tasks in the office should be scheduled 3 minutes apart. Task outside of the office should be scheduled six minutes apart. *Have an envelope, pen, paperclips, tapes and paper on the desk awaiting patients arrival* If there are no apparent problems continue until eight of the last ten pages have been answered correctly.

By item 9 if the subject has incorrectly answered, replied or performed a task for more than 4 pages or was unable to delete pages, review procedure the subject is having difficulty with and schedule another meeting for the next day. On the second day have a book and a piece of paper on the desk waiting for the subject. Subject should be given at least 8 pages.

	Replied	**Performed task**
Page 1: Please meet Sara by the door of the gym.	Y□ N□	Y□ N□
Page 2: Please meet Sara in her office for your appointment.	Y□ N□	Y□ N□
Page 3: On the paper in front of you please write the words, "Have a nice day."	Y□ N□	Y□ N□
Page 4: Clip a paperclip on the top of the paper.	Y□ N□	Y□ N□
Page 5: Please fold the paper you wrote on, in thirds and place it in the envelope.	Y□ N□	Y□ N□
Page 6: Write your name on the outside of the envelope and seal the envelope.	Y□ N□	Y□ N□
Page 7: Tape the outside of the envelope.	Y□ N□	Y□ N□
Page 8: Please bring the envelope to the front office, and hand it to Karen the secretary**.**	Y□ N□	Y□ N□
Page 9: Please delete the days pages, use your directions sheet if necessary. When you have completed this return to Sara's Office.	**Deleted** Y□ N□	
Page 10: Please meet Sara in front of the door of the chapel.	Y□ N□	Y□ N□
Page 11: Please call Sara's extension (8383) from the phone in the lounge and leave a message that you are calling as instructed.	Y□ N□	Y□ N□
Page 12: Please go to the commissary and immediately go to Sara's office and tell her if it is open or not.	Y□ N□	Y□ N□
Page 13: Please grab the book on the desk and sit down.	Y□ N□	Y□ N□
Page 14: Please take the piece of paper on the desk and fold it in half.	Y□ N□	Y□ N□
Page 15: Please put the paper in the book.	Y□ N□	Y□ N□
Page 16: Please hand the book to Sara.	Y□ N□	Y□ N□
Page 17: Please delete the days pages, use your directions sheet if necessary Y□ N□		
Page 18: Meet Sara in the Computer and Clerical Room in Rm. 122.	Y□ N□	Y□ N□
Page 19: Meet Sara by the door of the Art Room Rm. 125B.	Y□ N□	Y□ N□
Page 20: Meet Sara by the photocopy machine in Day Hospital.	Y□ N□	Y□ N□
Page 21: Please delete the day's pages, use your directions sheet if necessary.	**Deleted** Y□ N□	

AT THE END OF EACH SESSION SEND THE PATIENT PAGES REMINDING THEM TO DELETE THE DAYS MESSAGE: **Please delete the days pages, use your directions sheet if necessary.** *If the patient was unable to complete this task review with the patient how to delete pages correctly and even if patient has met criteria for answering pages correctly (8/10 of the last pages correct) schedule another appointment the next day and send some more pages to ensure deleting messages correctly.*

Able to delete messages independently. Should have successfully and independently deleted pages 3 consecutive times before end phase.

Y or N						

Appendix I: Baseline Pager Questionnaire

1) At what time do you need to wake up on weekdays to get to your program on time?
   _____

2) How do you get to and from Day Hospital?
   _____

3) What time do you have to leave to get to your program on time?
   _____

4) What items do you need to remember to bring with you to Day Hospital? Medication? Planner or memory book? Pencils and pens? Metro card? Glasses? Assignments? Other?
   _____

5) Is there anyone that we should contact regarding your participation in this study? Family or residence etc.?
   _____

6) What is the best way to contact you in case of an emergency?
   _____

7) What time do you think it would be best to send your pager reminding you to delete Messages? _____

8) What are your current living arrangements? Does anyone wake you up in the morning etc?_____

CENORR Pager number assigned to subject: _____

Verizon Pager ID _____

Phone number of pager assigned to subject _____

Appendix J: History Questionnaire

Name _____
Subject I.D. _____
Pager I.D. _____
Hospital I.D _____

Baseline date _____

Date of birth: _____
Age: _____
Gender: M F
Race: Caucasian Afr. Am. Hisp Asian Native Am. Other
Diagnosis: _____
Height: _____
Weight: _____
Marital Status: Never Married Married Remaried Divorced Separated
Widowed

Total years of education _____
Highest degree obtained _____

English first language _____
If no age learned English _____

Ever had ECT? Y N
If yes, date of most recent ECT treatment. _____

Ever hit your head, faint, aneurysm/stroke, have a seizure, get hit in head, car accident, or lose consciousness? Y N (circle relevant info) If yes: When? _____
If LOC: For how long unconscious? _____
Notes: _____
Number of previous hospitalizations _____

Age at onset _____
Age first treated by mental health professional _____

Source of Information:(circle all relevant info.) Day Hospital Chart Patient Clinician
Other _____

Where patient was referred to Day Hospital from. _____
Contact info: tel/address _____

What medications are you currently
taking?_____
Dosages_____
What are your current living arrangements?
_____

Is there anyone where you live that helps you to get ready to go to Day Hospital?
_____

Appendix K: Patient Satisfaction Questionnaire

Totally Disagree	Mostly Disagree	Somewhat Disagree	Somewhat Agree	Mostly Agree	Totally Agree
1	2	3	4	5	6

1) Rehabilitation activities in Day Hospital are meaningful and have helped me in my recovery 1 2 3 4 5 6
2) I would recommend Day Hospital to other people
   1 2 3 4 5 6
3) I get along well with the Day Hospital Staff.
   1 2 3 4 5 6
4) I get along well with the other clients in Day Hospital
   1 2 3 4 5 6

Name of Group: _____

I enjoy attending this group.	1 2 3 4 5 6
I find this group to be helpful.	1 2 3 4 5 6
I learn a lot in this group.	1 2 3 4 5 6
I am interested in the subject matter of this group.	1 2 3 4 5 6
I get along well with the other clients in this group.	1 2 3 4 5 6
I get along well with the staff members who run this group.	1 2 3 4 5 6

When I did miss this group it was because:

Illness or hospitalization	I was unable to get a ride	Bad weather	Did not feel like going	Other
1	2	3	4	5

If other please explain _____

Name of Group: _____

I enjoy attending this group.	1 2 3 4 5 6
I find this group to be helpful.	1 2 3 4 5 6
I learn a lot in this group.	1 2 3 4 5 6
I am interested in the subject matter of this group.	1 2 3 4 5 6
I get along well with the other clients in this group.	1 2 3 4 5 6
I get along well with the staff members who run this group.	1 2 3 4 5 6

When I did miss this group it was because:

Illness or hospitalization	I was unable to get a ride	Bad weather	Did not feel like going	Other
1	2	3	4	5

If other please explain

_____

Appendix L: Urging Subscale - Patient Version

Never	Once a month	Once every two weeks	Once a week	Once a day	More than once a day
1	2	3	4	5	6

How often in the last four weeks:

1) Has anyone encouraged you to under take some kind of activity? 1 2 3 4 5 6
WHO? _____

2) Has anyone accompanied you on some kind of outside activity because you did not dare to go alone? 1 2 3 4 5 6
WHO? _____

3) Has anyone carried out tasks that you normally do? 1 2 3 4 5 6
WHO? _____

4) Has anyone encouraged you to get up in the morning? 1 2 3 4 5 6
WHO? _____

5) Has anyone had to convince or force you to go to Day Hospital? 1 2 3 4 5 6
WHO? ____

6) Has anyone had to remind you to go to Day Hospital? 1 2 3 4 5 6
WHO? _____

7) Has anyone reminded you to bring items needed for Day Hospital? 1 2 3 4 5 6
WHO? ___

8) Has anyone had to remind you to attend a particular group? 1 2 3 4 5 6
WHO? _____

9) Has anyone had to remind you about an appointment with a 1 2 3 4 5 6
WHO? _____

10) Doctor, therapist, social worker or case manager? 1 2 3 4 5 6
WHO? _____

Please rate the following items:

Totally Disagree	Mostly Disagree	Somewhat Disagree	Somewhat Agree	Mostly Agree	Totally Agree
1	2	3	4	5	6

1) My family supports my participation in Day Hospital. 1 2 3 4 5 6
2) My family is involved in the day-to-day aspects of my recovery. 1 2 3 4 5 6
3) My family feels that involvement in a day treatment program like Day Hospital is an important part of my recovery. 1 2 3 4 5 6
4) My family feels that rehabilitation activities in Day Hospital are meaningful and have helped me in my recovery 1 2 3 4 5 6
5) At times, my family discourages me from going to Day Hospital and think that I could use my time more effectively. 1 2 3 4 5 6
6) My family thinks that instead of going to Day Hospital that I should get a job. 1 2 3 4 5 6
7) My family often speak to members of my treatment team about my progress. 1 2 3 4 5 6

Appendix M: Follow -Up Pager Questionnaire

1) Are you finding the pager to be useful? Yes No In what ways? _____

2) Does the pager always go off at the times you would like it to? Yes No
Please explain: _____

3) Do you have your pager with you at all times? Yes No
Please explain _____

4) Did you ever lose the pager? Yes No Did you find it? Yes No
For how long was it lost? _____

5) Did you ever forget your pager at home? Yes No How many times? _____
Do you remember the day(s) you left it at
home?_____

6) Is the pager difficult to use? Yes No
Please explain: _____

7) Do you ever find the pager annoying? Yes No
Please explain:_____

8) Do you ever find the pager disruptive or embarrassing? Yes No
Please explain:
_____

9) In the past week have you ever disregarded a page purposely? Yes No
How many times?_____
Please explain: _____

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