Enhancing and Promoting Recovery In Attentionally Impaired People Diagnosed With Schizophrenia: Results From A Randomized Controlled Trial Of Attention Shaping In A Partial Hospital Program

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Abstract

The attentional impairments associated with schizophrenia are well-documented and profound. Psychopharmacological and most psychosocial interventions have been shown to have limited effect in improving attentional capacity. That said, one form of psychosocial treatment, attention shaping procedures (ASP), has been repeatedly demonstrated to produce significant and meaningful change in various aspects of participant attentiveness behaviors. To date, studies of
ASP have been limited in that they have been conducted primarily with inpatients, have not assessed the generalizability of ASP's effects, and have not explored whether reinforcement is required to be contingent on performance of attentive behaviors. To address these limitations we conducted the first randomized clinical trial of ASP with people diagnosed with schizophrenia who are being treated in a partial hospital program. Our results indicate that ASP is effective in improving attention in people with schizophrenia in these types of programs, the effects of ASP generalize outside of the immediate treatment context to both other treatment groups and real world functioning, and contingent reinforcement is a critical ingredient of ASP. This project provides further evidence for the benefits of use of ASP in the recovery-oriented treatment of people diagnosed with schizophrenia who have significant attentional impairments.

**Keywords**

Schizophrenia; attention; cognitive remediation; behavior therapy; serious mental illness; recovery-oriented care

The attentional impairments associated with schizophrenia are well-documented and profound (Hahn et al., 2012; Millan et al., 2012; Nuechterlein, 1977). These deficits antedate the onset of schizophrenia (Fusar-Poli et al., 2012), become more pronounced once the full syndrome is present, and, for most people, do not fully remit after psychotic symptoms have resolved (Medalia & Choi, 2009). While these deficits are present in most people diagnosed with schizophrenia, there is marked heterogeneity in the degree to which they impact different people. Importantly, various researchers have demonstrated that the degree of attentional difficulties a person with schizophrenia has is inversely related to their social and vocational functioning, and quality of life (Addington & Addington, 2000; Evans et al., 2004; Green, Kern, & Heaton, 2004; Oie, Sundet, & Ueland, 2011; Ritsner, 2007). Furthermore, given that attentional capacity is a pre-requisite for higher-order cognitive skills (e.g. working memory) and learning, people with schizophrenia who have more severe attentional impairments tend to have significant impairments in multiple cognitive domains and gain the least from evidenced-based psychosocial treatments (Green, 1996; Green, Kern, Braff, & Mintz, 2000; Silverstein et al., 1998). Therefore, the treatment of these impairments represents an important avenue for improving both objective and subjective outcomes for people diagnosed with schizophrenia.

Psychopharmacological and psychosocial treatments have met with limited success in improving attention in people with schizophrenia (Barch, 2010). Psychopharmacological intervention with first- and second-generation antipsychotic medications, although a pillar of treatment of acute psychosis, has not consistently demonstrated positive effects on attention in people with clinically stable schizophrenia (Barch, 2010; Buchanan, Freedman, Javitt, Abi-Dargham, & Lieberman, 2007; Goldberg et al., 2007; Keefe et al., 2007). Various psychosocial interventions, largely subsumed under the label of cognitive remediation, although associated with large improvements in some cognitive domains (e.g. verbal learning and memory), also have a limited impact on attention (McGurk, Twamley, Sitzer, McHugo, & Mueser, 2007; Silverstein & Wilkniess, 2004; Wykes, Steel, Everitt, & Tarrier, 2008). Moreover, these programs are not designed for, and are rarely used with, people with...
the most severe attentional impairments. In contrast, a type of cognitive remediation called attention shaping procedures (ASP) has been consistently demonstrated to improve attentional capacity and treatment engagement even in people diagnosed with schizophrenia who are the most chronically ill and have attentional impairments (Menditto, Baldwin, & O'Neal, 1991; Silverstein et al., 2005; Silverstein et al., 1998; Silverstein et al., 2009; Silverstein et al., 1999; Spaulding, Storms, Goodrich, & Sullivan, 1986).

ASP is a behavioral intervention based on operant conditioning that aims to gradually increase a person's attentional capacity, or, more concretely, the amount of time spent performing behaviors reflecting attention to a target stimulus. In essence, it capitalizes on the well-known (e.g., Kraepelin, 1919/1971) and repeatedly demonstrated link between motivation and attention (reviewed in Silverstein, 2010). In ASP, successive approximations towards person-specific attentional goals are rewarded within the context of ongoing psychosocial treatment interventions. For example, for a person with a baseline attention span of 2 minutes and an ultimate attention goal of 10-minutes, progress towards this goal would be fostered by gradually changing the criterion for reward, over time and with repeated success, in one-minute increments (subgoals). Participant progress is reinforced through verbal praise and tangible reinforcers. A large body of research (e.g., Menditto, Baldwin, & O'Neal, 1991; Silverstein et al., 2005; Silverstein et al., 1998; Silverstein et al., 2009; Silverstein et al., 1999; Spaulding, Storms, Goodrich, & Sullivan, 1986) has demonstrated that ASP improves attention, task performance, and skill acquisition from psychosocial groups, regardless of individual differences in symptom type or severity, and intelligence.

While the effectiveness of ASP for improving attention, task performance, and learning enjoys robust support, prior studies have been limited in at least five ways. First, they have not explored whether ASP-related gains generalize outside of the immediate treatment context. That is, while attention within, and learning related to, groups that include ASP have been demonstrated to improve, it is unknown whether these gains extend to other treatment groups or to social and vocational functioning outside the clinical research context. Second, it is unclear whether ASP-related gains result from intrinsic or extrinsic motivation. Clearly, as a reinforcement-based intervention, ASP draws heavily on extrinsic motivation. That said, as Silverstein (2010) outlined, there is reason to believe that as a person's attention improves and he/she is able to learn skills that benefit them in and outside of the group (e.g. that lead to gratifying social interactions), intrinsic motivation increases and may eventually drive new behaviors more than extrinsic motivation. Third, in all past studies of ASP, participants who received ASP were given tangible (usually monetary) rewards, whereas participants in the control condition were not. Therefore, it cannot be determined from those studies whether pairing reinforcement with target behaviors is a critical ingredient in ASP, or whether receiving a reward in general (i.e., reward that is noncontingent upon behavior) could account for all or part of past treatment effects. Fourth, whether there are certain subgroups of people diagnosed with schizophrenia that particularly benefit from ASP and if so, what distinguishes these people from people who derive less benefit from the intervention, has yet to be explored. Finally, evidence for the effectiveness of ASP in non-inpatient settings is sparse (limited to a relatively small portion of the overall sample in Silverstein et al., 2009) and so evidence is needed on its effects outside of a state...
hospital setting. This point is of particular importance, because partial hospital programs are a primary treatment setting for many people with schizophrenia and positive findings in this group would support the widespread use of ASP.

In light of these limitations, the current project was undertaken. Herein we describe the impact of ASP on a sample of people diagnosed with schizophrenia who were identified by partial hospital staff as having attentional issues that significantly interfered with their ability to benefit from psychosocial interventions. To test the generalizability of ASP’s effects, participant attention was rated in non-study groups that did not use ASP, and a battery of role-play, performance-based, and self- and informant-report measures assessing learning and social and functional skills were completed. To determine whether there were changes in intrinsic motivation and related psychological factors, participants completed a brief battery of self-report measures assessing constructs such as perceived mastery in social situations and self-efficacy. Finally, to identify and characterize a subgroup of people with schizophrenia who respond particularly well to ASP, we compared people who showed a particularly robust response to ASP to those who showed a less robust response, on a range of study variables. We hypothesized that: 1) ASP would have a significant, positive impact on partial hospital participants’ attentional abilities and amount of skill acquisition in a social skills training group; 2) the effects of ASP on attention would generalize outside of the study group to attentiveness in other (non-study related) therapy groups; 3) the effects of ASP would generalize outside of the study group and positively impact real world functioning; 4) rewards contingent upon demonstrating attentive behaviors at criterion levels, but not non-contingent reward, would produce changes in attentiveness; 5) people receiving ASP would demonstrate significant increases on psychological variables such as sense of mastery and self-efficacy; and 6) the participants with the strongest responses to ASP would demonstrate the largest gains on all study variables.

As we describe this latest study of ASP, we wish to acknowledge our debt to Robert Liberman, a pioneer and giant in the field of psychiatric rehabilitation. Dr. Liberman made extensive use of shaping procedures in the treatment of schizophrenia, over many years, at the UCLA Clinical Research Center for Schizophrenia and Psychiatric Rehabilitation. Indeed, the first author's (SMS) initial exposure to shaping of appropriate within-group behaviors occurred during a multi-day training with Dr. Liberman at Camarillo State Hospital in 1993. There, he observed for the first time the powerful and positive effects that use of shaping procedures could have on increasing attentiveness and engagement, and on the enjoyment and personal satisfaction of group members. Since that time, Dr. Liberman has been a valuable mentor and advisor to our research group, including serving as co-author on a 2009 research report on ASP. While, among his many contributions, Dr. Liberman may be best known for his work on the development of skills training interventions, and on the concept and promotion of recovery, we wish here to recognize his seminal contribution to behavioral interventions for people with schizophrenia, including the use of shaping procedures to promote positive treatment outcomes.
Methods

Study Design

Participants were assigned to one of two therapeutic conditions: the UCLA Basic Conversations Skills Module (BCSM; Liberman & Wallace, 1990) with ASP, or the BCSM without attention shaping (control). Both groups met twice weekly for 22 weeks for a total of 45 treatment sessions. Each treatment session took 1 hour. The average number of sessions actually attended by participants in the ASP and control groups were 35 and 30, respectively. All participants were assessed at pretreatment and at the conclusion of treatment using selected measures of cognition, subjective experience, social and vocational functioning, and symptoms (see below for description of measures). Additionally, during each group session, participant attentiveness was rated using the interval sampling coding method described below.

Participants

127 people who met DSM-IV criteria for schizophrenia or schizoaffective disorder on the Structured Clinical Interview for DSM-IV diagnosis (First et al., 1995) and were being treated in a partial hospital program expressed interest in study participation. All participants were between 18-55 years of age and were identified by hospital staff as having significant attentional impairments that markedly impacted their ability to profit from psychosocial interventions. Participants were excluded from participation if they had a history of head trauma with loss of consciousness exceeding 10 minutes, neurological illness, or active substance abuse within six months of study enrollment. Detailed information about participant flow and attrition is available in Figure 1. Reasons for study discontinuation included partial hospital discharge, psychotic relapse, transfer to a state hospital, or subject relocation. No participant withdrew from the study for treatment-specific reasons. The groups were predominantly male (70% ASP, 79% Control) and Caucasian (63% ASP, 63% Control).

Using pre-treatment data, every effort was made to match study groups on baseline attentional functioning and Basic Conversation Skills Module comprehensive test (BCSM-T) scores (see below). Matching was successful for baseline BCSM-T scores (indicating equivalence between groups in pre-treatment social skills), but not for total minutes of attention during the first two group sessions (described below). Participants were recruited from, and groups were run at two university-affiliated partial hospital programs. Staff therapists from these sites ran the BCSM groups, while research study staff administered participant assessments, rated participant attention in sessions, and provided the within-group reinforcement.

Owing to participant availability and staffing resources across the two sites only two groups could be run concurrently. As such, initially, one site ran an ASP group while the other ran a non-ASP group. The site that initially used ASP and the nature of each subsequent group at each site was determined, after each new cohort completed pre-treatment assessments, using a computerized random number generator. In this way, participants were randomly assigned...
to treatment condition. On average, 6 participants were enrolled in each group in each treatment condition during each round of groups.

Interventions

**Basic Conversational Skills Module (BCSM)—**The BCSM (Liberman & Wallace, 1990) is a manualized, structured, skills training program from the UCLA Social and Independent Living Skills series. The BCSM focuses on five skill areas: recognizing verbal and nonverbal cues, starting a friendly conversation, keeping a conversation going, ending a conversation appropriately, and putting all these skills together. Each skill area is taught using seven standard learning activities (i.e., introduction to the skill area, videotape presentation with question and answer session, role-plays, resource management, outcome problems, in-vivo exercises, and homework assignments) that are based on behavioral principles and include abundant repetition of critical content and use of verbal praise. The first-author trained all study staff and therapists to deliver the BCSM, and he and an outside observer (SMW) monitored therapist fidelity throughout the study with the UCLA Therapist Fidelity Assessment for Modules (Wallace, Liberman, Mackain, Blackwell, & Eckman, 1992).

**Shaping—**Shaping is the application of reward-based learning techniques to bring about new, or modify existing behavior. The primary technique involved is differential reinforcement of successive approximations toward a target behavior. That is, rather than waiting for the desired behavior (e.g. 20 minutes of continuous) to occur before introducing a reward, reinforcement is provided for successive approximations toward the desired behavior, beginning with reinforcement of a variant of the behavior that is at the upper end of what the person can already achieve. When the initial step towards the desired behavior has been reinforced and occurs regularly (e.g. 2 minutes of continuous attention), the criterion for reinforcement is advanced to the next step in a pre-specified hierarchy (e.g. 3 minutes of continuous attention). This sequence of reinforcing, changing the criterion for reinforcement, fading reinforcers for previous goals, and limiting reinforcement to only behavior meeting the new criterion is repeated until the desired behavior is achieved. Thus, a strength of shaping is that it can be used to develop or strengthen behavior that does not normally occur or else occurs infrequently (e.g. attentiveness).

**Attention Shaping—**Beginning in the third group session, initial, individualized attentiveness goals were established for each ASP group participant. These were based on the median length of observed attentiveness episodes, recorded during the first two sessions by the non-interactive attention rater. Thereafter, at the outset of each group, each individual's goal, and the general criteria for attentiveness and inattentiveness were reviewed. Participant goals had two parts: duration of attentiveness (i.e. subtarget) and how many times the subtarget was met during the group session (i.e. class target). Each time a participant met a subtarget, he/she received two forms of reinforcement: verbal praise (including specification of the attentive behaviors engaged in) and a shaping ticket. When, in the course of the group, a participant met their class target, the group was briefly stopped while the change agent (see below) verbally reinforced the successful participant, regarding specific attentive behaviors he/she engaged in, in front of the rest of the group and gave
him/her $2 monetary reinforcement. This was then followed by congratulatory applause, and then the group session continued. Additionally, at the end of each group each participant received feedback about their performance relative to their class target in front of the group. Participants who did not meet their class target were informed what specific attentive behaviors they would have to show improvement on in order to be more successful in the next session (and then reminded again of this at the beginning of the next session). If a participant met their class target for two consecutive groups, their class target was increased following a pre-specified hierarchy; if a participant failed to meet their class target for two consecutive sessions, their class target was reduced to the next lowest goal in the hierarchy.

Group sessions for both treatment conditions had two trainers: Control groups had a leader and cotherapist and ASP groups had a leader and change agent. Change agents observed group participants and provided them with specific feedback about their inattentive and attentive behaviors, and when a subtarget was met, a shaping ticket. Change agents also used positive verbal reinforcement to encourage participants who were part-way through their subtarget goal. For example, if the participant's target was 10 minutes, the change agent might provide positive verbal reinforcement after 5 minutes of continuous attention and note that 5 more minutes of continuous attention would lead to earning a shaping ticket. Instances of inattentive behavior were addressed using a specific negative-positive prompt sequence that was designed to encourage extinction of inattentive behavior, and to ensure that attentive behaviors were reinforced more (by staff attention) than inattentive behaviors. The negative aspect of the prompt sequence included specification of the inattentive behavior that had occurred and a statement that this was an example of not paying attention that would interfere with the person's ability to earn their next shaping ticket. The positive aspect of the prompt sequence reminded the person that engaging in specific personally-relevant attentive behaviors would help them earn their next shaping ticket. If the participant resumed attentive behavior, this would be immediately reinforced with specific verbal praise, commenting on the attentive behavior. Continued inattention was not responded to in order to hasten extinction.

Control Group—In an effort to equate the groups on the total amount of tangible, external reinforcement, following each treatment session some people in the control group were selected to receive $2 rewards. The number of control group participants who received a reward for any group was based on the percentage of people in the most recent ASP group (typically the day before) who earned rewards. Therefore, the ASP and control groups were matched on total monetary reinforcement throughout the study, with the main difference being that for the ASP group reinforcement was contingent on frequency and quality of attentive behaviors, while for the control group reinforcement was non-contingent. Importantly, whereas participants in the ASP condition were informed that their reinforcement was for demonstrating specific levels of attentive behaviors, control group participants were told that as part of this research project, $2 rewards would be given out randomly to some people at the end of each group session. The orders of the names of the participants who would be rewarded in any given control group session were determined at pre-treatment, by generating 50 randomly-ordered lists of group participants' names, with each random order corresponding to one group session (e.g., the 3rd order was used for the
3rd session, the 8th order was used for the 8th session, etc.). At the end of each control group session, rewards were given out starting with the name at the top of the list, and then moving down the list until the number of participants to be rewarded (based on the prior ASP session) was reached.

Measures

The measures in the below battery were selected to assess participant characteristics that could be viewed as confounding factors (e.g., intelligence) and to assess change in the constructs we hypothesized would be influenced by ASP.

Intelligence

Shipley Institute of Living Scale, Vocabulary Subscale (SILS): The SILS (Zachary, 1991) is a brief assessment of verbal and nonverbal (abstract) intelligence. The SILS has excellent test-retest reliability and scores on the SILS correlate highly with IQ estimates from the Wechsler Adult Intelligence Scale (Zachary, Crumpton, & Spiegel, 1985; Zachary, Paulson, & Gorsuch, 1985). Because the vocabulary portion is relatively resistant to mental state changes whereas the abstraction score is not, we used the vocabulary score to estimate the abstraction score, and then the sum or both scores was used to estimate premorbid IQ scores using age and education-level normed tables in the test manual. IQ data were collected because we wanted to ensure groups did not significantly differ in premorbid intelligence and to determine if this variable had any impact on the amount participants gained from ASP.

Attention

Attention Ratings: Non-interactive raters used operationalized, behavioral criteria (available in Silverstein et al., 2009) to rate participants’ attentiveness in both conditions. Raters attended every group and observed participants for 10 seconds every minute. Participants were observed for the same 10-second interval each minute and during these intervals were rated as either attentive or inattentive. If any inattentive behavior was observed during a ten second interval, the participant was coded as being inattentive.

Reliability of Attention Ratings: All raters underwent the same training and annual reliability checks described by Silverstein and colleagues (2009). Briefly, at the outset of the study, raters reviewed a detailed attention rating manual and participated in a video-based training. The training videos included 466 ten-second clips of attentive and inattentive behavior that raters scored. At the conclusion of the training, scores from each rater were compared with the manual’s gold standard ratings to determine kappa coefficients. Additionally, a videotaped session of each change agent was created, annually, and sent to an outside rater (AAM) with thousands of hours of experience in shaping, to determine level of agreement between this rater and the on-site rater. Further, the outside rater also visited Rutgers once per year to rate groups in-vivo and to compare these ratings with those generated by the attention rater. Any instances of rater-drift were addressed in extra supervision with the first author and, when necessary, re-rating of the training videotapes until kappa coefficient levels of >.8 were obtained. As a result, in this study, across all raters and time points, the average kappa coefficient exceeded .80, indicating adequate inter-rater
reliability. Beyond their use to ensure high levels of reliability, these procedures were employed to minimize rater bias, since raters could not be blinded to which treatment condition participants were in.

**Symptoms**

**Positive and Negative Syndrome Scale (PANSS):** The PANSS (Kay, Fiszbein, & Opler, 1987) is a widely used interview-based assessment of symptoms associated with schizophrenia. The PANSS assesses 30 symptoms, which we reduced to 5 factors (positive, negative, cognitive, excitability, and depression; as per Lindenmayer, Bernstein-Hyman, & Grochowski, 1994). The PANSS has excellent internal and inter-rater reliability (Müller & Wetzel, 1998). To ensure symptom ratings were accurate and reliable, all raters underwent PANSS training and reliability checks prior to the initiation of data collection and then 2 more times during the course of the study. To pass these checks, a rater had to achieve an intraclass correlation (ICC) of at least .8 with the gold standard ratings, and the group as a whole had to achieve an ICC > .80 for its own ratings. Across the entire study, no rater failed to achieve this level.

**Cognition and Learning**

**MATRICS Consensus Cognitive Battery (MCCB):** The MCCB (Kern et al., 2008; Nuechterlein et al., 2008) is a neuropsychological test battery that includes assessments of working memory, attention/vigilance, verbal learning and memory, visual learning and memory, speed of processing, reasoning and problem solving, and social cognition. To summarize a person's overall cognitive ability, the MCCB produces an age- and gender-corrected global cognition T-score. The assessments making up the battery have excellent psychometric properties, small practice effects, no ceiling effects, and strong relationships with social functioning.

**The Schizophrenia Cognition Rating Scale (SCoRS):** The SCoRS (Keefe, Poe, Walker, Kang, & Harvey, 2006) is an 18-item interview-based assessment of cognitive functioning for people diagnosed with schizophrenia. Global scores were calculated based upon participant answers given to interview questions about functioning across several cognitive domains. The SCoRS has excellent inter-rater reliability and internal consistency, and interviewer ratings correlate significantly with performance on cognitive tests and measures of real-world functioning.

**Micro-Module Learning Test (MMLT):** The MMLT (Silverstein, Wallace, & Schenkel, 2005) is an analogue assessment of a person's ability to benefit from the primary components of skills training interventions. A person's responsiveness to, and ability to learn from, verbal and videotaped instruction, as well as ability to demonstrate skills through role-play, is assessed in a dynamic, interactive fashion that includes assessment of the ability to learn from repeated administration of material upon commission of errors. The MMLT outputs percentage correct scores for each subtest (i.e. verbal instruction, learning from modeling, and role-play), and also gives a total score. Domain and global percentage scores are calculated by dividing the total number of points earned by the participant by the total number of points possible and then multiplying by 100. Here we were only concerned with...
changes in the overall percentage correct scores. The MMLT has seven psychometrically
equivalent alternate forms, and excellent inter-rater and test-retest reliability. MMLT scores
have been found to predict full-length skills training group performance (Silverstein et al.,
2005).

**Attention Process Training Test II (APT-II):** The APT-II (Sholberg et al, 2001) is a 12-
item informant report of a person’s attention problems (e.g., “The client can only concentrate
for very short periods of time”; “The client misses details or makes mistakes because their
level of concentration decreased”). The APT-II assesses multiple forms of attention
including sustained, selective, divided, and alternating attention. APT-II measures were
completed by clinic staff based on their observation of study participants in regular clinic
groups.

**Social and Functioning Skills**

**UCLA Comprehensive Module Test for the Basic Conversational Skills Module
(BCSM-T):** The BCSM-T (Wallace, Liberman, MacKain, Blackwell, & Eckman, 1992)
assesses the amount of information a person has learned in each of the four skill areas taught
in the BCSM groups (described above). Participants' skill learning is assessed through self-
report, demonstration of skills, and role-plays. BCSM-T total scores are calculated by
summing the total number of points the participant earned across all skill areas and dividing
by the total number of points possible, and then multiplying by 100.

**Assessment of Interpersonal Problem Solving Skills (AIPSS):** The AIPSS (Donahoe,
Carer, Bloem, Hirsch, Laasi, & Wallace, 1990) is an assessment of a person's ability to
recognize and describe, and then develop and enact a plan to overcome, social problems.
Participants are asked to watch 13 videotaped social problem vignettes, identify the
interpersonal issue therein, and then role-play their solution to that problem in a simulation
test. Examinee's responses are then rated following specific criteria and a total score is
determined. The AIPSS has good test-retest and inter-rater reliability, and correlates
significantly with self-reported quality of life and real world functioning.

**Independent Living Skills Inventory (ILSI):** The ILSI (Wallace, Liberman, Tauber, &
Wallace, 2000) is an 89-item informant report that measures the extent to which individuals
are able to competently perform a broad range of skills important for successful community
living. It contains 11 subscales including interpersonal skills, home maintenance, cooking,
and medication management. For the purposes of this study, only the 9-question
interpersonal skills subscale was used. The ILSI's internal consistency, test-retest reliability,
and inter-rater reliability are all excellent.

**Self Report Measures**

**Self-Efficacy – Social Situations Subscale (SESS):** The SES (McDermott, 1995) is a 57-
item self-report measure developed to assess feelings of competence in the management of
positive and negative symptoms, as well as perceived social efficacy, in people with
schizophrenia spectrum conditions. In this study, only data on self-efficacy in interpersonal
situations was collected. The SESS has high internal consistency and test-retest reliability,
and correlates significantly with measures of psychosocial functioning (Pratt, Mueser, Smith, & Lu, 2005).

**Interpersonal Competence Questionnaire (ICQ):** The ICQ (Buhrmester, Furman, Wittenberg, & Reis, 1988) is a 40-item structured interview that assesses subjective feelings of competence in interpersonal situations that has been modified for use with people diagnosed with schizophrenia (Semple, et al., 1999). Respondents rate their perceived competence in a range of hypothetical interpersonal situations on a Likert-type scale with four answer choices that range from “I am poor at this” to “I am extremely good at this”. The content of the ICQ's five subscales closely parallel skills taught in the UCLA BCSM: 1) initiation of interactions; 2) negative assertion; 3) self-disclosure; 4) provision of support to others; and 5) conflict management. This modified version of the ICQ has demonstrated excellent internal consistency for each subscale and total scores, and good discrimination of people with schizophrenia from non-psychiatric controls (Semple et al., 1999).

**Mastery Scale (MS):** The MS (Pearlin & Schooler, 1978) is a 7-item self-report scale that assesses perceived ability to change. Questions are answered on a 5-point Likert-type scale ranging from “Strongly Disagree” to “Strongly Agree”. The scale outputs an overall score with higher scores representing greater perceived ability to change. Adequate psychometric properties have been demonstrated with this scale in psychiatric populations (Rosenfield, 1997).

**Analytic Plan**

As in previous ASP studies (e.g., Silverstein et al., 2009) change in attentiveness was quantified in two ways. First, the average total minutes of attentiveness per group during the first two groups each participant attended was compared with this average for their final two sessions. This was done for study groups, and for one non-study group (to assess generalizability outside of study groups) for each participant. Second, each participant's time series of attentiveness scores during their study group (across all study sessions attended) was characterized by three parameters: a mean, linear slope with the 1st order autoregressive component removed, and root mean square error which reflects day-to-day variability around a person's overall linear trend. These parameters are considered ideal for the characterization of dynamic systems over time (Thiel, 1966) and have been gainfully used to analyze symptom course and treatment response in samples of people diagnosed with schizophrenia (Kupper & Hoffmann, 2000), including in past studies of attention shaping (e.g., Silverstein et al., 2009).

Groups were compared on background variables and dependent variables at each time point using independent samples t-tests and chi-square tests of independence. To study change over time, groups were compared on all dependent variables using 2 (group) X 2 (time) repeated measures ANOVAs. Finally, to split the ASP group into those participants who showed an enhanced response to the intervention and those who did not, we calculated the mean and standard deviation of the slope of the mean duration of attentiveness episodes for the control group (mean = -.003, SD = .025) and designated those participants in the ASP group scoring two standard deviations above the mean of the control group (.048) as “Super
Responders”. All other ASP participants were considered “Responders” (note, however, that while ASP Responders demonstrated the least degree of change among ASP participants, they nevertheless still demonstrated significantly greater improvement than control subjects). These two groups were compared on all study variables using the same analytic techniques described immediately above.

Results

The means, standard deviations, and the results of all between-group comparisons for the study’s dependent variables are presented in Tables 2 and 3.

Pre-Post treatment Comparisons between ASP and Control Conditions

Participant Characteristics—At baseline, there were no significant differences between the ASP and control conditions in age ($t(76)= 1.17, p = .247$), education level ($t(76)= -.525, p = .601$), estimated IQ ($t(76)= -1.43, p = .157$), or number of groups attended ($t(76)= 1.53, p = .129$). There were also no significant differences between the groups in terms of race ($\chi^2(2) = .394, p = .821$) or sex ($\chi^2(1) = .438, p = .508$). Descriptive statistics for the study groups are available in Table 1.

Effects of Shaping on Attentiveness

In study groups: The two groups significantly differed at baseline on total minutes of attention and mean duration of attentiveness per episode. Specifically, on average, at baseline, subjects in the ASP condition paid attention 5.13 minutes less and had a mean duration of attention that was 0.58 minutes less than participants in the control condition. For both of these variables, there was a significant main effect of time, as well as a group x time interaction. By the final two sessions, the ASP group improved their total attentiveness by 10.42 minutes and their mean duration of attentiveness episodes by 3.58 minutes. In contrast, the control group evidenced 4.87 and .018 minute reductions in total attentiveness and mean duration of attentiveness, respectively. On both variables, the post group differences were statistically significant and characterized by large effect sizes ($d = 1.61$ and $.79$, respectively). Taken together, these results indicate that ASP leads to marked improvement in the number of total minutes participants pay attention in a group, and to longer periods of attentiveness.

For slope of total minutes of attentiveness and mean duration of attentiveness, the ASP group demonstrated significantly steeper slopes of improvement over the course of treatment. Additionally, RMSE differed significantly between groups for mean duration of attentiveness, but not for total minutes of attentiveness. These results converge with the above to suggest that regardless of the operationalization of attentiveness, ASP leads to significantly overall improved attention.

In non-study groups: At baseline, there was no difference between groups in total minutes of attentiveness, but there was a difference in mean duration of attentiveness. More specifically, on average, the duration of attentiveness for ASP participants was .87 minutes less than for participants in the control group. There were not significant main effects of...
time for either variable, but for both duration of attentiveness and total minutes of attentiveness there were significant group x interactions. The ASP group increased their total attentiveness by 10.45 minutes and their mean duration of attentiveness by 1.97 minutes, while total attentiveness and mean duration of attentiveness decreased by 1.5 minutes and 29 minutes, respectively, in the control group. These results suggest, for the first time, that the effects of ASP generalize very well outside of groups in which it is used.

**Effects of Shaping on Symptoms**—At pre-treatment, there were no significant differences between groups on any PANSS symptom or factor. There were no main effects for time, but the group x time interaction was significant for the Cognitive and Depression factors with the ASP group improving significantly more than the control group. The only significant post-treatment difference between groups was on the Depression factor.

**Effects of Shaping on Cognition and Learning**—There was a significant baseline difference between the conditions on the MCCB and the MMLT with the ASP group demonstrating poorer cognitive and learning abilities than the control group. From pre- to post-treatment, there were significant main effects of time and significant group x time interactions for the MCCB and MMLT. On the MCCB, the ASP group composite T score improved by 5.36 at post-treatment while the control condition’s average T score remained approximately the same (η² = .18, medium-to-large effect). On the MMLT, the ASP group’s score increased by 15% while the control group’s score increased by 4%. The between group differences on the MCCB and MMLT were no longer statistically significant at post-treatment. There were no pre or post treatment differences, main effects of time, or group x time interactions for the SCoRS or APT-II. Taken together, these results suggest that ASP markedly improves peoples’ cognitive skills and ability to learn, though it does not impact their subjective experience of cognitive issues. Practically, this means ASP should increase a person’s ability to profit from various treatment and real world learning experiences (e.g., psychotherapy; informational television shows or lectures).

**Social and Functional Skills**—At pre-treatment, the groups were rated similarly on each measure except that participants in the ASP condition were rated as having significantly poorer interpersonal skills on the ILSI than participants in the control condition. There were main effects of time for the BCSM-T, AIPSS, and ILSI, but the group x time interactions were not significant for any of these measures and there were no statistically significant post-treatment differences between groups. The magnitude of the gains on the BCSM-T and AIPSS were quite large, with both groups gaining 25 percentage points on the BCSM-T and 6 percentage points on the AIPSS. Thus, while our results do not suggest differential improvement in social or functional skills as a result of ASP in a partial hospital sample, which is in contrast to prior research with long-stay state hospital inpatients (Silverstein et al., 2006; 2009), they do support the efficacy and effectiveness of the BCSM for use with even people diagnosed with schizophrenia who have the most severe attentional impairments being treated in partial hospital programs.

**Self-Report Measures**—There were no statistically significant pre-treatment or post-treatment differences, main effects, or interaction effects for any self-report measure.
Pre-Post Comparison of ASP Super Responders and Responders, defined by the Slope of the Mean Duration of Attentiveness Episodes

**Participant Characteristics**—At baseline, there were no significant differences between Super Responders and Responders in terms of age ($t(38)= .952$, $p = .347$), education level ($t(38)= -.339$, $p = .737$), or estimated IQ ($t(38)= .669$, $p = .669$), but on average, the ASP Super Responder group attended more ASP sessions than did the Responder group ($t(38)= -2.095$, $p = .043$). There were also no significant differences between the groups in terms of race ($\chi^2(2) = 4.43$, $p = .109$) or sex ($\chi^2(1) = .001$, $p = .974$). Descriptive statistics for the study groups are available in Table 1.

**Effects of Shaping on Attentiveness**—At baseline, there were no differences between Super Responders and Responders in terms of total minutes of attentiveness or mean duration of attentiveness, but there were significant main effects of time and significant group x time interaction effects for both variables. By the final two groups, Super Responders increased their total minutes of attentiveness by approximately 16 minutes and mean duration of attentiveness by approximately 7 minutes, while Responders evidenced only 7 and 2-minute improvements. Both of these post-treatment differences were statistically significant. Additionally, the groups significantly differed on the slope of total minutes of attentiveness, mean duration of attentiveness, and RMSE for mean duration of attentiveness. Thus, it appears the method used to divide the groups resulted in a meaningful separation of subjects in terms of their response to treatment.

**Effects of Shaping on Symptoms**—At pre-treatment, there were no significant differences in symptoms between groups. From pre- to post-treatment, there was a significant main effect of time for ratings of the severity of positive and negative symptoms, and a group x time interaction for negative symptoms (with the Super Responder group demonstrating a greater reduction). The groups did not significantly differ at post-treatment on either variable. That said, the post-treatment between-group difference for negative symptoms was characterized by a medium effect size ($d = .53$) thereby suggesting a between-group difference did exist, but we did not have enough power to detect it. There were no significant main effects, interaction effects, or post-treatment differences between groups on any other PANSS factors. The finding regarding negative symptoms is notable as it provides additional evidence of the generalization of skills taught in the ASP group. More specifically, it seems reasonable to assume that the attentive behaviors encouraged in the ASP group served to counter many of the behavioral criteria for negative symptoms (e.g., avoidance of eye contact, poverty of speech, and other signs of withdrawal) and thus, resulted in lower ratings for negative symptoms.

**Effects of Shaping on Cognition and Learning**—There were no baseline differences between Super Responders and Responders on any measure of cognition or learning. From pre- to post-treatment, there were significant main effects of time for the MCCB and SCoRS, and a significant group x time interaction for the SCoRS. There were no other main effects for time or group x time interactions. At post-treatment, the groups significantly differed on the SCoRS ($d =1.54$) and APT-II ($d =1.02$) with ASP Super Responders reporting fewer cognitive issues and being rated as more attentive. Taken together, these
results suggest that participants who respond particularly well to ASP experience differential reductions in the experience of cognitive impairment associated with schizophrenia and, outside of the immediate treatment context, appear to be more engaged and attentive.

**Social and Functional Skills**—At pre-treatment, the groups did not differ on any measure of social or functional skills. There were significant main effects of time for the BCSM-T, AIPSS, and ILSI indicating both groups increased their social knowledge and skill level, social problem solving abilities, and independent living skills over the course of the study. The group x time interaction was significant for the BCSM-T and AIPSS, but not the ILSI. At post treatment, Super Responders improved by 42% on the BCSM and 12% on the AIPSS, while Responders gained 16% on the BCSM-T and evidenced no gain on the AIPSS. In contrast, on the ILSI, Super Responders showed no improvement, while Responders demonstrated improvement in independent living skills. These results demonstrate that ASP-related attentional improvement positively impacts the amount participants gain from the BCSM and the degree to which they can generalize information gained in-group to novel social situations.

**Self-Report Measures**—There were no significant pre-treatment between-group differences, or main effects or group x time interactions for any self-report measure. There was a significant post-treatment difference on the ICQ whereby Super Responders reported feeling more competent in social interactions than did Responders.

**Discussion**

The purpose of our study was to determine: 1) the effectiveness of ASP in a partial hospital environment; 2) the generalizability of ASP’s effects to non-study groups; 3) the effects of ASP on real-world social functioning; 4) the relative effects of contingent vs. non-contingent reinforcement; 5) the effects of ASP on aspects of subjective experience such as intrinsic motivation and perceived level of mastery in social situations; and 6) characteristics of those participants for whom the treatment is most effective. Our results indicate that ASP significantly improves attention in people diagnosed with schizophrenia who are being treated in partial hospital programs, and that the effects of ASP generalize outside of the immediate treatment context, but that it does not lead to differential changes in constructs related to subjective experience of self-efficacy or mastery in social situations. Importantly, contingent reinforcement of attentive behaviors appears to be a critical ingredient of ASP. Finally, analyses comparing participants who responded particularly well to ASP with participants who did not revealed that those who responded most strongly to ASP showed larger gains on a variety of study measures (e.g., symptom reduction, social engagement), including learning of new skills in the treatment group, thereby demonstrating ASP’s effects are at once non-uniform and far reaching.

Of our results, we believe the following warrant special attention. First, across all observational attentiveness metrics, participants in the ASP group significantly improved their ability to pay attention in both study and non-study groups and this was not true for participants in the control condition. In fact, ASP participants increased their attention span by over 10 minutes for both types of groups, while control participants evidenced decreases.
in attention (presumably due to boredom, as per anecdotal reports). This gain in within-
group attention mirrors the effect Silverstein and colleagues (2009) found for inpatients with
schizophrenia and suggests partial hospital patients can benefit from ASP as much as
individuals who are more acutely ill. That the gain in attention was equivalent for ASP
participants for study and non-study groups highlights the remarkable power of attention
shaping to change behavior across contexts and, for the first time, the generalizability of
ASP’s effects.

That participants in the control condition evidenced reductions in their ability to pay
attention over the course of the study, if considered more than just an artifact of the
limitations in the precision of observer ratings, is disconcerting: treatment as usual, which is
designed to have a positive impact, is not even maintaining baseline functioning. This
concern is only heightened when the significant differences between groups in change
between time points and post treatment scores on various measures of cognition and learning
are considered. Ultimately, our results suggest that a relatively simple modification to group
treatment in partial hospitals can, at a minimum, forestall progressive disengagement and in
many cases, lead to meaningful improvements in attentional and cognitive functioning for
many people.

Second, we were able to divide ASP participants into two groups based on their response to
the treatment: those who responded particularly well and those who showed a less robust
response. Although these participants did not significantly differ on any study variable at
baseline, highly responsive participants evidenced differential change on a number of study
variables including reductions in negative symptoms and improvements in social and
functional skills. The implication of these findings is twofold. First, in practice, people
should not be excluded from ASP groups based on any clinical or demographic variables.
Instead, any person diagnosed with schizophrenia with a significant attentional impairment
should be enrolled in and expected to benefit from the treatment. Second, given that some
people with schizophrenia do respond particularly well to ASP, future research should be
aimed at identifying those factors that distinguish highly responsive participants from those
who are less responsive, and variations of ASP should be developed to enhance the
intervention's effects for people who respond sub-optimally to standard procedures. To this
end, we are currently investigating the predictive ability of laboratory measures of
reinforcement learning to predict ASP response.

Third, participants in the ASP group showed a statistically significant increase in composite
MCCB scores while the control group evidenced no change. The magnitude of the
difference between pre and post treatment scores for the ASP group was approximately half
of a standard deviation (d = .59). This change is noteworthy given the nature of our sample
(i.e. highly impaired) and that cognition focused interventions, such as computerized
cognitive remediation and procognitive medication have rarely resulted in gains this large,
and, when similar gains have occurred, they have sometimes been on a modified MCCB
composite score that excluded the social cognition factor (e.g., Lane et al., 2009).

Fourth, as has been demonstrated previously (e.g., Silverstein et al., 2009), changes in
attention occurred independently of changes in psychotic symptoms, although they were
associated with reductions in cognitive symptoms and depression. Moreover, when only ASP participants were considered, those participants who were highly responsive to ASP evidenced a differential reduction in negative symptoms. This latter finding is novel and suggests treatment providers can use ASP as a tool for people with schizophrenia evidencing pronounced negative symptoms. Although the mechanism by which this change occurs is unknown, it seems reasonable to hypothesize that ASP leads to reductions in negative symptoms by reducing behaviors (e.g., poverty of speech) typically interpreted as evidence of negative symptoms and thereby leads to lower observer ratings on these symptoms.

Fifth, we did not find that self-report measures of various psychological constructs related to mastery of social situations, self-efficacy, or perceived interpersonal competence differentially improved as a result of ASP. Even participants who were highly responsive to ASP did not report changes over time on these variables. These findings are contrary to our hypotheses and somewhat perplexing given participants in the ASP and control groups demonstrated increased understanding of and ability to use social skills, and this was particularly the case for participants who responded most strongly to ASP.

Several study limitations are of note. First, although our participant groups were generally well matched, there were some significant baseline differences between groups. Most prominently, baseline total minutes of attention was significantly lower in our ASP group. While this may have allowed for greater gains in attention for the ASP group, supplemental analyses comparing ASP Responders (i.e., not Super Responders) to control subjects revealed that despite having similar baseline scores, these ASP participants still evidenced greater gains in attention over time than control participants. This suggests that the effects we observed result from treatment and are not an artifact resulting from baseline group differences. Second, it is unknown whether participants in the ASP group reached the attentiveness levels of people not selected to participate in the study. Future studies should collect attentiveness ratings on people with schizophrenia not included in ASP to determine whether ASP participants are approximating attentiveness levels in people not identified as being attentionally impaired. Having such data will provide another means of assessing the impact of ASP. Third, there was a lack of blindness to several aspects of the study. For example, while research assistants were blind to eventual group assignment during pre-treatment assessments, this was not the case during post-treatment assessments, as there were not sufficient staffing resources to support staff for testing who were not also needed for the in-group co-therapist, change agent and/or attention rater roles. In addition, attention raters could of course not be blind to which group they were observing, and participants were aware of whether they were involved in ASP. To reduce potential bias, as noted in Methods, we had outside raters (i.e., not involved in any other aspect of the study, and not part of Rutgers) with extensive experience in attention shaping provide annual ratings of fidelity to intervention delivery (for both ASP and BCSM), and ratings of attentiveness to assess inter-rater reliability. This was done annually using both videotapes and in-vivo ratings. That high levels of reliability were observed throughout the study between on-site and outside raters suggests that fidelity and accuracy of ratings were not unduly affected by bias. However, the strongest test of this would be if all assessors at pre- and post-treatment assessment points were blind to subject condition. Finally, whether the positive effects of
ASP are maintained after the conclusion of treatment is unknown, although this is currently being explored.

In sum, our findings add to the growing body of literature (Menditto, Baldwin, & O'Neal, 1991; Silverstein et al., 2005; Silverstein et al., 1998; Silverstein et al., 2009; Silverstein et al., 1999; Spaulding, Storms, Goodrich, & Sullivan, 1986) demonstrating that ASP profoundly improves attention in people diagnosed with schizophrenia who have marked impairments. Further, across multiple metrics of various constructs related to attention, cognition, social and functional skills, and learning, we found that ASP leads to meaningful improvements. Moreover, for the first time, ASP was shown to be an effective intervention in a partial hospital setting and the effects of ASP were shown to extend beyond the immediate treatment context to other groups and to influence, among other things, neuropsychological test performance and participants' ability to learn. Given the consistency and magnitude of its effects for people with schizophrenia regardless of their background characteristics and symptom profiles, we believe all people with schizophrenia who have attentional impairments should be offered ASP whether to augment psychosocial groups (Menditto, Baldwin, & O'Neal, 1991; Silverstein et al., 2005; Silverstein et al., 1998; Silverstein et al., 2009; Silverstein et al., 1999; Spaulding, Storms, Goodrich, & Sullivan, 1986) or computer-based remediation efforts (Combs et al., 2008). To be sure, at present, ASP is underutilized: few treatment programs, whether inpatient or partial hospitals, use ASP, despite the large number of people with schizophrenia who continue to demonstrate limited response to treatment.

Acknowledgments

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Figure 1. Effectiveness Trial Of Attention Shaping For Schizophrenia
Table 1
Means, standard deviations, and percentages for demographic variables for all study groups

<table>
<thead>
<tr>
<th></th>
<th>ASP (n = 43) Mean (SD)</th>
<th>Control (n = 38) Mean (SD)</th>
<th>ASP Super Responders (n = 16) Mean (SD)</th>
<th>ASP Responders (n = 26) Mean (SD)</th>
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<tbody>
<tr>
<td>Age</td>
<td>45.12 (11.28)</td>
<td>42.71 (12.03)</td>
<td>43.44 (12.86)</td>
<td>46.12 (10.57)</td>
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<td>Years of education</td>
<td>11.88 (1.82)</td>
<td>12.08 (1.99)</td>
<td>12.00 (1.79)</td>
<td>11.81 (1.90)</td>
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<td>Estimated IQ</td>
<td>83.90 (11.91)</td>
<td>87.92 (12.92)</td>
<td>83.06 (10.87)</td>
<td>84.75 (12.90)</td>
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<td>Number of groups attended</td>
<td>34.67 (12.87)</td>
<td>29.79 (11.74)</td>
<td>40.06 (14.10)</td>
<td>32.46 (10.12)</td>
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<td>Percent White</td>
<td>62.8</td>
<td>63.2</td>
<td>43.8</td>
<td>73.1</td>
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<tr>
<td>Percent male</td>
<td>69.8</td>
<td>78.9</td>
<td>68.8</td>
<td>69.2</td>
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<td>Control Group (n = 38)</td>
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<td></td>
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<td>Posttreatment</td>
<td>Pretreatment</td>
<td>Posttreatment</td>
</tr>
<tr>
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<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
</tr>
<tr>
<td>Total Minutes of attentiveness</td>
<td>16.97 (7.51)</td>
<td>27.38 (8.55)</td>
<td>22.09 (9.67)</td>
<td>17.22 (9.87)</td>
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<td>Mean duration of attentiveness</td>
<td>2.07 (0.72)</td>
<td>5.65 (5.51)</td>
<td>2.65 (1.15)</td>
<td>2.45 (1.49)</td>
</tr>
<tr>
<td>Slope total minutes of attentiveness</td>
<td>-</td>
<td>0.06 (0.10)</td>
<td>-</td>
<td>0.52 (0.16)</td>
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<tr>
<td>Slope mean duration of attentiveness</td>
<td>-</td>
<td>0.06 (0.03)</td>
<td>-</td>
<td>0.03 (0.02)</td>
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<td>RMSE total minutes of attentiveness</td>
<td>-</td>
<td>8.47 (3.86)</td>
<td>-</td>
<td>32.22 (21.25)</td>
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<td>RMSE mean duration of attentiveness</td>
<td>-</td>
<td>8.82 (0.51)</td>
<td>-</td>
<td>6.65 (2.54)</td>
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<td>Attention nonstudy group</td>
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<td>Total minutes of attentiveness</td>
<td>4.91 (6.69)</td>
<td>19.36 (11.62)</td>
<td>2.38 (5.01)</td>
<td>10.88 (9.64)</td>
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<td>Mean duration of attentiveness</td>
<td>1.27 (538)</td>
<td>3.23 (264)</td>
<td>1.34 (562)</td>
<td>1.85 (852)</td>
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<tr>
<td>PANSS</td>
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<td></td>
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<td>11.62 (4.48)</td>
<td>10.63 (4.04)</td>
<td>11.70 (3.38)</td>
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<td>9.78 (3.77)</td>
<td>11.81 (3.77)</td>
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<td>BCSM-T</td>
<td>22.20 (10.10)</td>
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<td>60.49 (19.94)</td>
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<td>AIPSS</td>
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<td>50.81 (20.02)</td>
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<td>6.50 (1.57)</td>
<td>6.08 (2.07)</td>
<td>6.45 (1.31)</td>
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<td>Control Group (n = 38)</td>
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<td>---------</td>
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<td>Posttreatment</td>
<td>Pretreatment</td>
<td>Posttreatment</td>
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<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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<tr>
<td>MS</td>
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<td>19.64 (3.32)</td>
<td>19.72 (3.98)</td>
<td>19.89 (3.80)</td>
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<td>APT-II</td>
<td>25.08 (9.47)</td>
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<td>24.43 (5.42)</td>
<td>24.20 (6.27)</td>
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</table>

All between-group comparisons are reported as F-tests.

* p < .05,
** p < .01,
*** p < .001.

MCCB = MATRICS Consensus Cognitive Battery; SCaRS = Schizophrenia Cognition Rating Scale; BCSMT = UCLA Comprehensive Module Test for the Basic Conversational Skills Module; MMLT = Micro-Module Learning Test; AIPSS = Assessment of Interpersonal Problem Solving Skills; SESS = Self-Efficacy – Social Situations Subscale; ICQ = Interpersonal Competence Questionnaire; MS = Mastery Scale; APT = Attention Process Training Test II; ILSI = Independent Living Skills Inventory.

*PQ: In the above figures – .052 and – .003, the decimal point doesn't show up.
Table 3
Means, standard deviations, and comparisons between ASP super responder and responder groups for all study variables

<table>
<thead>
<tr>
<th>Measure</th>
<th>&lt;TSH&gt; ASP Super Responders (n = 16)</th>
<th>ASP Responders (n = 26)</th>
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<th></th>
<th></th>
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<th>Group x Time Interaction</th>
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<tbody>
<tr>
<td></td>
<td>Pretreatment Mean (SD)</td>
<td>Pretreatment Mean (SD)</td>
<td>Post</td>
<td>Post</td>
<td>Post</td>
<td>Post</td>
<td>Difference</td>
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<td>Mean (SD)</td>
<td>Mean (SD)</td>
<td>Treatment</td>
<td>Treatment</td>
<td>Treatment</td>
<td>Difference</td>
<td>Time Effect of Time</td>
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<td>Posttreatment</td>
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<td>Measure</td>
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<td>Measure</td>
<td>Difference</td>
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<td></td>
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<tr>
<td></td>
<td>Mean (SD)</td>
<td>Mean (SD)</td>
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<tr>
<td>Total minutes of attentiveness</td>
<td>17.56 (7.17)</td>
<td>33.22 (5.84)</td>
<td>16.52 (7.95)</td>
<td>24.13 (8.15)</td>
<td>.183 (40)</td>
<td>.1505 (40) **</td>
<td>.80244 (40) ***</td>
<td>.667</td>
<td>9.58 (40) **</td>
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<tr>
<td>Mean duration of attentiveness</td>
<td>2.20 (7.16)</td>
<td>9.13 (7.59)</td>
<td>2.80 (7.40)</td>
<td>3.65 (0.01)</td>
<td>.752 (40)</td>
<td>.7.98 (16.30) **</td>
<td>33.816 (40) ***</td>
<td>.458</td>
<td>12.78 (40) ***</td>
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<td>Slope total minutes of attentiveness</td>
<td>-</td>
<td>144 (.309)</td>
<td>-</td>
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<td>6.76 (40) **</td>
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<td>-</td>
<td>.014 (.021)</td>
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<td>.057 (40)</td>
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<td>5.98 (15.59) **</td>
<td>-</td>
<td>-</td>
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<td>9.40 (3.60)</td>
<td>8.50 (3.49)</td>
<td>2.22 (31)</td>
<td>.127 (31)</td>
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<td>11.23 (5.46)</td>
<td>14.45 (6.41)</td>
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<td>12.30 (4.11)</td>
<td>11.35 (4.61)</td>
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<td>7.35 (1.55)</td>
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<td>Pretreatment Difference (SD)</td>
<td>Posttreatment Difference (SD)</td>
<td>Main Effect of Time</td>
<td>Group x Time Interaction</td>
<td>( \eta^2 )</td>
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* All between-group comparisons are reported as F-tests.

* \( p < .05 \),

** \( p < .01 \),

*** \( p < .001 \).

MCCB = MATRICS Consensus Cognitive Battery; SCORs = Schizophrenia Cognition Rating Scale; BCSM-T = UCLA Comprehensive Module Test for the Basic Conversational Skills Module; MMLT = Micro-Module Learning Test; AIPSS = Assessment of Interpersonal Problem Solving Skills; SESS = Self-Efficacy – Social Situations Subscale; ICQ = Interpersonal Competence Questionnaire; MS = Mastery Scale; APT = Attention Process Training Test II; ILSI = Independent Living Skills Inventory.