Behavioral Interventions for Alleviating Psychotic Symptoms

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Behavioral interventions can augment the effects of antipsychotic medication in alleviating hallucinations, delusions, and conceptual disorganization. Such interventions may be based on operant conditioning and reinforcement strategies and on training in coping skills. Reinforcement strategies have been used to decrease the rate of confused speech, delusional talk, and other psychotic behaviors, but they appear to have little effect on the subjective distress patients experience as a result of such symptoms. Strategies that teach patients skills for coping with psychotic symptoms include cognitive reframing methods, nonconfrontational methods that help patients find alternative explanations for delusions, and use of humming to interfere with subvocal movements of the larynx muscles, which may be related to auditory hallucinations. The authors review studies of the effectiveness of these interventions and suggest an approach integrating reinforcement and training in coping skills that may help reduce psychotic symptoms.

Early descriptions of schizophrenia highlighted positive symptoms of the disorder, including hallucinations, delusions, and formal thought disorder (1,2). Clinicians attempting to remediate these positive symptoms using antipsychotic medications have had limited success; some patients experience residual symptoms as acute episodes abate (3), and other treatment-refractory patients are unresponsive to traditional drug effects (4).

Clinical investigators have argued that treatment integrating medication and rehabilitation strategies yields the best outcome (5). Cognitive rehabilitation strategies have been developed to augment medication therapies by targeting the substrata of the positive symptoms of schizophrenia (6). However, these interventions have not yet been adequately evaluated, and their theoretical underpinnings require further development.

Alternately, behavioral interventions have been developed to address psychotic symptoms directly. Reinforcement strategies have been used to decrease the frequency of manifest behaviors that coincide with hallucinations, delusions, and conceptual disorganization. In addition, strategies for teaching patients skills to counter psychotic symptoms have been developed. Typically, these interventions require the coordinated effort of a clinical team and are best conducted in an inpatient setting. Still, many of these strategies can be adapted for use in outpatient care.

This paper reviews the strengths and weaknesses of behavioral strategies for addressing psychotic symptoms. Our goal is to increase clinicians' awareness of the range of behavioral interventions from which appropriate interventions may be selected to meet specific treatment goals.

Reinforcement strategies

Investigators have used various positive and negative contingencies to directly reduce the bizarre symptoms that appear to be related to psychoses in patients with schizophrenia. In some patients, these symptoms may appear to take the place of social and self-care skills that patients lack. Patients may never have acquired such skills during their formative years when prodromal symptoms were prominent. Hence, behavioral strategies that help patients enlarge their repertoire of skills may secondarily cause significant diminution in psychotic symptoms. In addition, reinforcement strategies that directly try to decrease the frequency of bizarre behavior have been tested.

Increasing prosocial behaviors

In their discussion of the effects of the token economy, Ayllon and Azrin (7) argued that psychotic symptoms increase in frequency when the frequency of appropriate social and self-care skills decreases. For example, patients might replace impoverished conversation skills with delusional material. Hence, psychotic symptoms should decrease as functional behaviors improve.

Paul and Lentz (8) tested these assumptions using a rigorous token economy that combined rich positive reinforcement for prosocial skills with response costs for inappropriate behaviors. Results showed that as patients improved their interpersonal and self-care skills, their hallucinations, delusions, and frequency of incoherent speech decreased significantly.

Unfortunately, the hypothesis that communication skills and delu-
sional talk were inversely related was not tested directly in these investigations. Symptom reduction could also be attributed to other explanations. For example, delusions may decrease when a token economy targets symptom management skills that result in patients’ becoming more compliant with medication. Alternately, delusions may diminish because inappropriate “sick talk” is directly extinguished or punished by operant contingencies. In addition, research has suggested that schizophrenic patients who participate in active recreational programs show fewer psychotic symptoms (9). Hence, nonspecific variables related to the mildly active treatment intervention may account for reduction in psychotic behaviors. Perhaps psychosis remits because patients’ stress levels diminish as they are involved in active interventions.

**Targeting psychotic behaviors.** The hypothesis that operant contingencies directly extinguish talk about delusions has been examined in various studies (10). Wince and colleagues (11) compared the efficacy of token contingencies to verbal feedback in decreasing the frequency of delusional speech by ten paranoid schizophrenic patients. During the token-based intervention, subjects received tokens at fixed intervals for not voicing delusional statements. Feedback comprised correcting delusional statements by pointing out the falsity of the statements. For example, the therapist would tell a patient who had said he was Jesus Christ, “Your answer is incorrect; Jesus Christ lived almost two thousand years ago. Your name is Mr. M, and you are 40 years old.”

Results of the study showed that the rate of delusional statements both within the training sessions and on the ward decreased for seven of the ten subjects after token contingencies were implemented. Conversely, five subjects showed no effects after receiving feedback, and delusional speech actually increased in three subjects after feedback. Those three patients may have experienced confrontation as excessively stressful, leading to exacerbation of psychotic symptoms.

In another study, the frequency of delusional speech by four chronic schizophrenic patients was shaped by controlling access to social reinforcers (12). Subjects were individually paired with a favorite staff member each evening to share pleasant banter, coffee, fruit, and other snacks. After several noncontingent meetings, subjects were told that the length of the evening chat would be proportional to the amount of delusion-free talk accumulated during four daily interviews. After 18 days of contingent social reinforcement, the frequency of delusional speech diminished between 200 and 600 percent across the sample. Social reinforcers were then slowly withdrawn; for example, evening chats were offered every other night. Three of the four subjects maintained rational speech after the social contingencies were decreased.

Investigators have studied the effects of punishing contingencies on the frequency of talk about hallucinations (13,14). In a study by Wein-gaertner (14), 45 patients were randomly assigned to one of three conditions. Patients in a self-shock condition wore a low-voltage metal box on their belt and were told to deliver a small shock to their hand each time they hallucinated. Patients in a placebo condition wore a similar box that did not deliver a shock and were given the same instructions. These subjects were told that although they might not feel the shock, it was still effective. Subjects in a third group received no intervention. After two weeks of treatment, subjects in all three conditions reported significantly reduced hallucinations, with no differences between groups.

Equal improvement for subjects in both punishing conditions—those who used the functional shock boxes and those who used the dysfunctional boxes—suggested a placebo effect. However, similar amelioration in the control group’s functioning is more difficult to understand. These findings may be attributed to a selection bias because more than 50 percent of potential subjects refused to participate in the study. Perhaps subjects who were willing to join in a self-punishment study were highly motivated to decrease hallucinatory speech.

Weingaertner (14) found several subject variables that were related to reductions in hallucinatory behavior: patients who had a less chronic course, simple hallucinatory content, and belief in the intervention’s effectiveness reported fewer hallucinations during the study. These findings suggest that relatively fewer disturbed patients benefited from this intervention, a pattern that needs to be replicated in future research. Alternately, these results may have reflected a natural recovery process that is more common in the less disturbed group.

**Significance of reinforcement strategies.** The findings from these studies suggest that reinforcing and punishing contingencies may significantly decrease the frequency of delusional speech and reports of hallucinations either directly by targeting related behaviors or indirectly by increasing patients’ skills repertoire. This area of treatment research is remarkable for its high quality. Subject and treatment variables were well controlled in these studies, and their internal validity is sound. Given that most people with whom patients interact experience patients’ reports about visions and voices as bizarre, patients who can discriminate appropriate versus inappropriate situations for discussing their hallucinations may benefit greatly.

Unfortunately, operant strategies for managing psychotic symptoms are limited by disregard for patients’ phenomenological experience that coincides with symptoms. Although patients may be talking with others about hallucinations and delusions less frequently, they may still be experiencing the intense anxiety, depression, and anger that results from being bombarded by these images and thoughts. Moreover, given the current interest in patients’ self-monitoring of symptoms (15), clinicians must be mindful of the possible deleterious effect of teaching patients not to express symptoms. Ability to monitor warning signs is significantly jeopardized by contingencies to ignore them. Perhaps the best use of operant techniques is as a
discriminant learning tool that helps patients distinguish the situations in which they should and should not speak about their psychoses.

Skills for coping with symptoms
Reinforcement models for reducing hallucinations are also limited because they are partly based on the view that hallucinations are secondary manifestations of misperceptions of environmental stimuli. In this interpretation, hallucinations result from poor attention and information processing. This perspective is not consistent with patients' reports that characterize hallucinations as independent, internal stimuli. Taking an approach that recognizes patients' internal experience of symptoms, clinical investigators have developed cognitive behavioral and psychoeducational strategies that help patients acquire skills to control delusions, hallucinations, and conceptual disorganization.

Reducing delusions. The first step in ameliorating delusional beliefs is understanding their effect on the individual. Unfortunately, measuring these effects is difficult. Some investigators have operationalized and subsequently measured delusions by calculating the percent of patients' speech that is observed to be delusional. This approach has been criticized, however, because delusional material is not easy to identify objectively (16,17). Moreover, measuring delusions from speech frequency alone ignores the patient's phenomenological experience of the symptom, which is especially relevant to the aversive aspects of delusions.

Assessment of the private experience of delusions may be achieved by instructing schizophrenic individuals to report the degree of belief conviction, anxiety associated with the delusion, and preoccupation with the belief (18,19). These experiences can be operationalized to be measured on continuous scales. In addition, patients' reaction to hypothetical evidence contradicting their delusional beliefs can be assessed by using operationalized scales or by coding responses to open-ended questions (18).

Cognitive reframing methods may diminish the frequency and experience of delusions. Lowe and Chadwick (19) adopted Beck's "collaborative empirical" approach (20) to reframe the delusions of two chronic schizophrenic patients. In this intervention, patient and clinician jointly evaluated the evidence or lack of evidence supporting a delusion.

Results of a multiple-baseline design for the first subject showed that conviction, preoccupation, and anxiety about delusions about a fictitious spouse and Jesus Christ diminished soon after being targeted. These effects generalized to reduction of a third delusion as well, a belief about Leonardo da Vinci. Three delusions of the other patient also decreased after they were collaboratively challenged. Although variation in the measures across observation periods was high, trends suggested that the second patient's preoccupation and anxiety with each delusion were also diminished. Other, less sound studies found similar results using gentle confrontation (21,22).

Watts and colleagues (17) argued that some patients may react to the challenging of their delusions, especially those that are self-aggrandizing, by becoming noncompliant with treatment prescriptions. To avoid this outcome, clinical investigators have recommended adopting a collaborative rather than confrontative approach; two studies have specifically tested the relative merits of each strategy (19,23).

Results of one study involving 12 patients showed that verbal challenge decreased convictions about delusions in two patients and decreased anxiety and preoccupation with delusions in four patients (19). Patients for whom the verbal challenge was unsuccessful were subsequently exposed to guided reality testing. Two additional patients in this group decreased their levels of conviction, anxiety, and preoccupation with delusions.

In a more direct test of the relative effects of confrontation versus collaboration, 16 patients were randomly assigned to either a confrontational group or a collaborative belief modification group (23). Therapists in the confrontational group were firm but polite. For example, in response to a patient's delusion that a mechanical device had been surgically implanted in his body, the therapist said, "You are quite wrong, I'm afraid. You have no scar; therefore the device could not have been implanted." Therapists in the belief modification group avoided disagreement; rather, they taught patients to search for alternative explanations to the delusion.

Results showed that subjects from both groups experienced a decrease in social anxiety, intensity of the delusions, and overall psychopathology. However, the belief modification group experienced a greater decrease in delusional intensity than the confrontational group. These findings suggest that collaborative empiricism produces the best effects in restructuring delusions.

Findings from these studies suggest that reframing techniques can significantly help patients to manage their delusions. However, conceptually disorganized patients may have difficulty complying with reframing prescriptions. For example, a thought-disordered patient may be unable to search for explanations to delusions in an orderly way. This is not a trivial point, given the high rate of conceptual disorganization that coincides with delusions. Research is needed to determine whether conceptual disorganization diminishes reframing effects. Deliberious effects of cognitive disorganization may be addressed through cognitive rehabilitation strategies such as attention focusing (24) or semantic elaboration (25).

Reducing auditory hallucinations. Clinical investigators have reasoned that if subvocal activity (subtle movements of the larynx muscles) is causally related to auditory hallucinations, then procedures that interfere with subvocal activity should diminish the frequency of these hallucinations. In support of this view, research has shown that patient reports of auditory hallucinations correlate with subtle movements of the chin and lip muscles recorded by electromyograph (EMG) (26,27).
Bick and Kinsbourne (28) tested clinical implications of this hypothesis by instructing schizophrenic subjects to perform various exercises involving movement of muscles in the face or hands when experiencing auditory hallucinations. Subjects in the subvocal-specific exercise group were instructed to open their mouths widely, and subjects in the control condition were told to close their eyes tightly or to clench their fists. Patients completing the subvocal-specific exercises reported fewer auditory hallucinations than subjects using the control exercises.

Green and Kinsbourne (29) replicated these findings with humming as the subvocal-specific behavior and opening the mouth, biting the tongue, and lifting eyebrows as the control conditions. Patients who hummed reported fewer hallucinations. Results from this study showed that humming increased subvocal EMG activity above baseline. The investigators concluded that this subvocal-specific exercise interfered with EMG activity related to auditory hallucinations.

Although these results look promising, another study failed to find a significant relationship between subvocal muscle movement and auditory hallucinations (30). Moreover, although Green and Kinsbourne (29) were able to show that behavior that interferes with subvocal movement decreases reports of auditory hallucination and is associated with significant changes in EMG measures, they found little actual relationship between reports about auditory hallucinations and EMG measurements of vocal musculature. The authors concluded that the effectiveness of humming may not depend on a close temporal relationship between the auditory hallucination and EMG measurements.

One hypothesis is that humming distracts patients, effectively drowning out auditory hallucinations (31). This hypothesis has not been supported, however. Alpert (32) found that patients actually reported more hallucinations in conditions with louder noise levels than in softer noise conditions. To directly test the distraction hypothesis, Green and Kinsbourne instructed subjects in their study to hum quietly; significant diminution of hallucinations were still found.

Another theory is that humming may require greater cognitive effort than control tasks, thereby diminishing attention to hallucinations. Alternately, humming may directly interfere with cognitive processes that coincide with hallucinations (33). However, subjects in Green and Kinsbourne's study reported that the control condition (raising eyebrows) required more effort than humming. Similarly, participating in activities that require effort, like educational or psychotherapy groups, does not seem to diminish hallucinations.

Reducing conceptual disorganization. In addition to having delusional content, the speech of many patients with schizophrenia is disorganized and marked by tangential associations, autistic logic, and neologisms. Meichenbaum (34,35) used social reinforcement to diminish the rate of "sick talk" and increase the frequency of "healthy talk" in thought-disordered patients. In a follow-up, Meichenbaum and Cameron (36) used a mixture of reinforcement, instructions, and self-talk of instructions by patients to improve patients' cognitive functioning in several areas. The investigators used graduate students as models who "talked aloud" mnemonic strategies governing a digit-span task, a second span task with distracting stimuli, a proverbs task, a Holzman ink-blot test, and an interview.

For example, during the distraction task, the graduate student model said, "Now, I am going to hear numbers read separately by a man and a woman. I should listen carefully to what the woman says and ignore the list read by the man." After observing the model, subjects were encouraged to instruct themselves using similar rules. They received positive feedback for correct rehearsals. Subjects who participated in the self-instruction group increased their performance on a proverbs test and on an inkblot test at a greater rate than subjects who participated in a control group. Moreover, the percentage of "sick talk" decreased at a greater rate for the self-instruction group.

Evidence from subsequent studies testing self-talk effects on conceptual disorganization have been mixed. Two studies replicated Meichenbaum's findings (37,38), although other studies were unable to replicate his results (39,40). Margolis and Shemberg (40) were unable to find differences between subjects who participated in a self-monitoring treatment and subjects in a no-treatment control group. After the study, subjects reported that self-reward strategies seemed "silly and babyish." Bentall and associates (37) concluded that generic self-statements may be ineffective when they are prescribed programmatically. Self-monitoring strategies are more powerful when schizophrenic patients are asked to target behaviors and to use self-statements that are more relevant to the situation and to the person.

These equivalent findings may reflect methodological flaws in the studies. The original investigations were conducted in an era when schizophrenia was frequently overdiagnosed. The medication status of the patients was not tracked during the course of the studies.

Research by Harrow and his colleagues (41) examining impaired perspective and thought disorder challenged some fundamental assumptions underlying the self-talk approach to ameliorating conceptual disorganization. In that study, 83 acutely ill patients were asked to rate whether their own and other patients' responses to proverbs on the Gorham Proverbs Test were conceptually disorganized. Results indicated that psychotic subjects' ratings of other patients' responses were similar to those of independently trained judges. However, psychotic patients' ratings of their own responses were markedly disparate from those of the judges.

Although discordance rates were more pronounced for patients who experienced higher levels of thought
disorder, even nonpsychotic patients were unable to recognize typicality in their responses. How can patients guide thought processes with self-talk when they cannot reliably recognize their disorganized cognitions? Perhaps turning one's perspective on oneself makes an additional intellectual demand that exceeds the cognitive capacity of disturbed patients.

Findings by Meichenbaum and Cameron (36) suggested that patients can be trained to observe their own bizarre verbalizations. The researchers taught patients to monitor and evaluate the level of abstraction to proverbs by modeling the monitoring of verbalizations on self-assessment of sensorimotor skills. However, it is not apparent whether improvement in evaluating levels of abstraction was related to self-monitoring of disorganized thinking. Perhaps patients decreased their overall speech rate after learning self-talk and thus decreased opportunities for disorganized speech. Future research must address these competing hypotheses.

**Combining operant and coping approaches**

Operant and skills-based approaches to decreasing psychotic symptoms have had significant effects on the manifest components of hallucinations, delusions, and conceptual disorganization. They are also fruitful heuristics for guiding future research and directing development of treatments. Figure 1 shows a model that can be used to guide the clinical decisions of practitioners who wish to include these treatments in their armamentarium.

Selection of behavioral strategies for psychotic symptoms depends on whether these symptoms are acute or chronic. Practitioners should assess the short-term course of acute symptoms; they may remit spontaneously or after a short course of antipsychotic medication and may not require behavioral intervention. Still, the clinician may decide to teach a patient coping strategies to handle symptoms should they recur.

If symptoms persist, the clinician should decide whether to use operant or coping approaches. Operant strategies are recommended when symptoms are significantly disruptive or bizarre, affecting the life options of the patient. For example, reward strategies might be selected when a patient's discharge is delayed because of annoying or bizarre delusions. The clinician may choose coping-based strategies when symptoms are significantly distressing to the patient. For example, humming should be tried with patients who are haunted by hallucinations.

Collaborative empiricism may be appropriate for delusions that are preventing the patient from accomplishing certain life goals but are not perceived as problematic by the patient. For example, collaborative empiricism was used with a patient who was not able to maintain a full-time job because he was convinced that he was soon going to be selected to star in a major motion picture.

Use of the decision tree is illustrated in a case example. Mr. J is a 34-year-old white male with a 15-year history of mental illness. He has been a patient on the extended care unit of a state hospital for the past 18 months. Even though he denied that talking aloud to demons was problematic, unit staff had noted this bizarre behavior since admission and expressed frustration that the patient would not "try to control his hallucinations."

The patient's case manager designed a reinforcement program in which Mr. J received five tokens for
each 30-minute period in which he did not speak about demons. He was also fined ten tokens for each bizarre verbalization. His rate of hallucinatory self-talk diminished by 80 percent after two weeks of these contingencies. However, he still hallucinated several times each day despite adjustments of his contingencies.

Additional behavioral analyses showed that Mr. J tended to talk about his delusions when he was anxious about family visits, delayed trips to the commissary, and other issues. His case manager taught him to unobtrusively hum to diminish the impact of the delusions. Staff reported almost complete elimination of statements about demons soon after. Moreover, Mr. J reported for the first time that he had some control over the demons.

Conclusions

The combination of operant and skills-based approaches to ameliorating psychotic symptoms is compatible with integrative treatment strategies using medication and psychosocial interventions that have been recommended for the treatment of schizophrenia (5). The array of behavioral interventions described in this paper includes several options from which clinicians may choose in devising strategies to address the stubborn and disruptive symptoms of schizophrenia.

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