Auditory Hallucinations, Source Monitoring, and the Belief That "Voices" Are Real

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Abstract

The term *source monitoring* refers to a variety of cognitive processes individuals use to determine whether an experience originated within the self or came from an external source. A belief that auditory hallucinations are real entities independent of the self may be considered an error in source monitoring. The Source Monitoring Framework (SMF) is the most developed and empirically validated model of how ordinary individuals judge whether an event was self-generated or occurred in the outside world. This study of 41 acute inpatients is a first attempt to apply the SMF to autobiographical reports of auditory hallucinations in a clinical setting. Consistent with the SMF, results suggest that similarities between "voices" and real speakers may offer a partial explanation of why patients believe the voices are real. While the SMF provides a useful conceptual background for examining the phenomenology of these voices, the types of source monitoring errors typically encountered in normal individuals do not fully account for this belief as it occurs in psychotic individuals.

Keywords: Auditory hallucinations, reality monitoring, source monitoring, reality testing, delusion, insight, psychosis.

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Auditory hallucinations are a common symptom of schizophrenia (Kraepelin 1971; Carpenter et al. 1974) and a variety of other pathological conditions (Assad 1990) and occur as well in individuals not otherwise diagnosed as mentally ill (Posey 1986; Slade and Bentall 1988). The belief that "voices" are "real" is also a common clinical phenomenon (Goodwin et al. 1971) and one that often persists even during periods of remission of acute psychotic illness (Larkin 1979). Reality is ever apparent, fundamental to our definition of psychosis, but difficult to define. In his classic text of phenomenology, Jaspers (1972) states that reality is irreducibly linked to perception and the meanings we give to perceptions. In an effort to bring a more operational definition to the concept of reality, Aggernaes and coworkers (Aggernaes 1972; Aggernaes et al. 1976) posited seven criteria for real experiences as opposed to imagined events. According to Aggernaes, real experiences have (1) the subjective quality of sensation (the experience is perceived in one of the five senses), (2) relevance to behavior, (3) publicness (it can be experienced by others), (4) objectivity (it is perceptible in more than one sense modality), (5) existence (it exists even when no one is experiencing it), (6) involuntarity (existence of the object is outside the person's control), and (7) independence (the person does not believe the experience is dependent upon an unusual, transient change in state of mind that the person would associate with a mental disturbance or illness). Aggernaes (1972) studied 41 individuals with schizophrenia reporting hallucinations to determine which of these characteristics of reality patients might attribute to their hallucinations. The most frequently endorsed reality attribute was sensation (93%), a finding replicated by Ramanathan (1982). These studies suggest that the subjective quality of sensation is a near-universal feature of auditory hallucinations. This characterization is consistent with the descriptions of others (Arieti 1974; Garety and Hemsley 1994) and autobiographical reports of auditory hallucinations (Lang 1938, 1939; Deegan 1996).

Review of the Literature

Since Aggernaes, most studies of reality testing in hallucinators have involved laboratory paradigms rather than investigations of patient descriptions of the hallucinatory experience. Bentall (1990) reviewed over 175 such studies of hallucinations and concluded that "hallucinators make hasty and overconfident judgments about the source of

their perceptions and have a bias toward inappropriately attributing their perceptions to an external source" (p. 90). For early studies of reality monitoring, see also Mintz and Alpert (1972), Heilbrun (1980), Bentall and Slade (1985), Harvey (1985), Heilbrun et al. (1986), Harvey et al. (1988), and Tanenbaum and Harvey (1988). More recent theories attempting to explain a failure to recognize voices as self-generated focus on cognitive dissonance, intentionality, speech perception, and source monitoring. For example, some investigators have suggested that people who believe they are in control of their thoughts experience intrusive, unexpected thoughts as coming from outside (as hallucinations) because such thoughts contradict their belief that they control their own thinking (Morrison et al. 1995; Morrison and Haddock 1997; Baker and Morrison 1998). Frith (1987, 1998) has hypothesized that an experience is identified as self-generated when the outcome of a motor or speech act matches an expectation generated at the inception of the act; that is, intention "labels" an event as being of internal origin. Auditory hallucinations might then arise from a defect in internal monitoring where unexpected subvocal speech is experienced as an auditory hallucination. Hoffman (1986) has attributed auditory hallucinations to a disruption in speech planning (Hoffman 1991; Hoffman and Satel 1993). Disruptions of discourse planning are said to produce speech products not experienced as part of the self. More recently, Hoffman and McGlashan and others (Hoffman and McGlashan 1997, 1998; Hoffman et al. 1999) have suggested that auditory hallucinations arise from disordered speech perception when verbal working memory produces disordered linguistic expectations during speech processing that result in word percepts in the absence of external sound. David (1994) explains the not-self experience of hallucinations as a failure of feedback mechanisms in speech reception and speech generation centers, while also suggesting the possibility of an "ectopic" speech generator.

Source Monitoring

The Source Monitoring Framework (SMF) developed by Johnson and Raye (Johnson 1988*a*, 1988*b*; Johnson and Raye 1981, 2000) and others (Johnson et al. 1981, 1984, 1988*b*, 1988*c*, 1993) is perhaps the most comprehensive and empirically validated model of how normal individuals determine whether a remembered event was of external (real) or internal (imagined) origin. Johnson and Raye (2000) suggest that the SMF may also help to explain positive symptoms of schizophrenia that involve a failure to identify experiences as self-generated. The SMF is a comprehensive model of how memories are evaluated. Despite the fact that voices are an immediate, ongoing experience rather than a memory, the SMF merits an exploratory

application to psychotic phenomena because of its promise in other clinical arenas. According to the SMF, the brain does not differentiate real and imagined events by attaching informational "markers" that allow the individual to make the distinction. Instead, according to the SMF, a variety of information embedded in a memory at the time it occurs later serves as the basis of judgments about the origin of the memory. "The characteristics of mental experience that provide it with the quality of reality are similar for perceptions, event memories, and beliefs: sensory detail; embeddedness in spatial and temporal context; embeddedness in supporting memories, knowledge, and beliefs; affect; and the relative absence of consciousness of the cognitive operations producing the event or belief. Reality testing and ongoing perception . . . are complex judgment processes that are subject to error and more difficult in some situations than others" (Johnson et al. 1993, p. 14).

The SMF posits two independent source monitoring processes. Heuristic source monitoring (heuristic SM) compares perceptual, temporal, semantic, affective, and other qualities of the current experience with what one has come to expect of examples from already familiar sources (Johnson and Raye 2000). If the current experience matches the prototype of a particular source, the experience is attributed to that source (Johnson and Raye 1981). A second and independent process, systematic source monitoring (systematic SM), includes strategies that generate additional retrieval cues and supporting memories, and reasoning about the plausibility of a memory's source in light of the person's prior beliefs. In most cases, heuristic SM and systematic SM arrive at the same source attribution. When these processes reach different conclusions, one system may serve as a "reality check" on the other, leading to a reassessment of a memory's source.

Laboratory studies of the SMF have examined the ability of psychotic subjects to distinguish between (1) self-generated items (most often words) and externally generated items; (2) externally generated items from two different sources; (3) actual versus imagined events; and (4) different internal sources (Rankin and O'Carroll 1995; Brebion et al. 1996, 1997, 1999, 2000; Vinogradov et al. 1997). One of the most frequently replicated findings in laboratory studies is that hallucinators compared with psychiatric controls and normals are more likely to attribute self-generated items to someone else (Bentall et al. 1991; Keefe et al. 1999). The SMF has not been systematically applied to naturalistic reports of auditory hallucinations. Normal subjects are able to describe the characteristics of memories and the judgment processes they use outside the laboratory to distinguish real memories from imagined events (Johnson et al. 1988*c*), but eliciting analogous descriptions from psychotic patients is more difficult. Individuals may, in any case, have limited introspective

access to their own cognitive processes, and explanations offered by individuals about the origin of their thoughts may be of limited validity (Nisbett and Wilson 1977). Psychotic patients do offer reasons for their beliefs (Garety and Hemsley 1994), including beliefs about voices (Chadwick and Birchwood 1994), but explanations are not always clear and coherent. Chapman and Chapman (1988) observed *cognitive slippage* (an upsurge of psychotic disorganization) when patients attempted to explain their delusional ideas. These difficulties notwithstanding, if hallucinators engage in heuristic SM and systematic SM, one might expect to find evidence of these processes in their explanations of their beliefs.

If heuristic SM contributes to a hallucinator's conclusion that the voice is an external entity, the SMF would predict that hallucinations have many characteristics in common with listening to and talking with real speakers. Suggestive of this possibility, in many cases the hallucination conveys age, gender, accent, loudness, and emotional tone (Nayani and David 1996; Leudar et al. 1997). In addition to personifying qualities of vocal timbre, voices may have an interpersonal dimension (Benjamin 1989) that patients might consider when making source monitoring judgments. This "interpersonal" relationship is often dynamic. Patients frequently engage in dialogue with their voices (Leudar et al. 1997; Honig et al. 1998; Davies et al. 1999), and dialogue implies an exchange between distinct entities or parts. Voices may maintain a semantically consistent organization day to day, as might a real speaker (Hoffman et al. 1994). The often grammatical coherence of the voice (as opposed to the fragmented quality of musings and daydreams) may add to the illusion that the voice is another person. It is possible that these personified and interactive qualities all contribute "personlike" characteristics that would add weight to heuristic comparisons of the voice with real speakers. Believing an entity to be "real" because of its interactive capacities is the basis of Turing's test for artificial intelligence (Turing 1950). In Turing's test, a human subject interrogates (e.g., via keyboard) two unseen entities. If one of the entities is a computer, and the human subject is unable to determine this on the basis of the human's interactions with the entities, the computer might be said to possess artifical intelligence. In Turing's view, interaction is *the* essence of how we recognize a thinking entity. The more complex its interactive capacity, the more autonomous, alive, and real an entity appears.

Strauss has questioned the widespread belief that only large-scale quantitative studies constitute legitimate research (Strauss and Hafez 1981). He argues that optimal advances in knowledge follow a balanced integration of quantitative methods and systematic clinical observation in which close attention is paid to what patients say about

their experiences (Strauss 1989). Our study was undertaken as a systematic observation as defined by Strauss (Strauss and Hafez 1981) in that interviews were semistructured, recorded, and transcribed, and data analysis focused not on a single case study but on clinical phenomena occurring in multiple patients examined against the backdrop of a single organizing paradigm—the SMF. It was a qualitative investigation (Jones 1995; Pope and Mays 1995; Meyers and Hansen 1997) intended to complement quantitative laboratory investigations. The primary purpose of the study was to determine how the SMF accords with first person patient reports of voices.

Methods

Subjects enlisted for this study were inpatients on an acute inner-city psychiatric service who presented with auditory hallucinations. Patient recruitment lasted 9 months. Informed consent was obtained from each subject. Primary staff were invited to refer patients who reported "hearing voices" and were willing to talk about their experience. No patients who heard only machine noises or crude sounds were referred. Clinical data were gathered from a series of semistructured interviews that generally lasted an hour. All interviews were conducted by the primary investigator, whenever possible with the primary therapist present to help put the patient at ease. The interviewer inquired in an open-ended way about the patient's hallucinations with an interest in what stood out for the patient about the experience. An effort was made to follow the same general outline of inquiry with all patients. All interviews were recorded on audiotape, then transcribed, with transcriptions checked for accuracy against the original tape. The interview began with an explanation of the purpose of the interview and a series of set questions regarding the voices. To establish whether patients were reporting an auditory percept akin to their experience of sound, early in the interview they were asked, (1) "Do you hear the voices clearly just as you are hearing the sound of my voice now?" and (2) "When you are hearing voices what do you hear?" Then patients were asked (3) "Do you have a back and forth conversation with the voices where the voices say something, you respond, and they respond to you?" Next patients were asked about several personifying features, including (4) "Do you recognize the voices?" (5) "Do the voices have proper names?" and (6) "Do the voices know things about you?" Patients were also asked (7) "Can the voices predict the future?" and (8) "Do the voices appear in your dreams?" (phenomenon noted by Chadwick and Birchwood [1994] and possibly relevant to patient beliefs). Patients were also asked, (9) "Can other people hear your voices?" Midway through the interview, patients were

asked (10) "Do you think of the voices as being real, or do you think of them as being part of your own mind or imagination?" Because a patient's experience of the voices may be complex, a forced-choice question "Are the voices real or imaginary?" as employed by Goodwin et al. (1971) was not adopted. Patients were interviewed in an attempt to elicit information potentially relevant to heuristic SM ("What do the voices sound like?") and to inquire whether and how information was used by patients to explain the source of the voice (systematic SM).

Answers to the above ten set questions were examined and coded. Next, all sections of all transcripts where patients talked about their belief in the reality of their voices were identified, labeled by patient number, and combined into a single document. This combined transcript was examined for important recurrent themes. Ten items were identified that occurred in five or more

patients. These became additional categories for coding. These items are provided in Table 1 (items from combined transcripts). The original individual patient transcripts were then reexamined and rated for the presence or absence of each of these 10 items. Transcripts were also examined for spontaneous mention of the Aggernaes criteria noted in the introduction (1972); when the criteria were not spontaneously referenced by patients, an attempt was made to rate the transcript as a whole as being consistent with each Aggernaes criteria or not, with the exception of the category Existence, which could not be rated without specific inquiry by the interviewer. In total, the transcripts were coded for 26 factors: the initial 10 set questions, the 10 categories derived from the combined transcript, and 6 Aggernaes categories.

Subjects consisted of 41 consecutively referred patients (16 males, 25 females) presenting with auditory hallucina-

Table 1. Categories of personification, interaction, and other evidence cited by patients to support their belief in the reality of their voices

Qualities of the voice	Entire sample (n = 41) n (%)	Schizophrenia subsample (n = 32) n (% subsample)	Substance abuse subsample (n = 9) n (% subsample)
Initial items			
Is clear, like a spoken voice	40 (98)	32 (100)	8 (89)
Is gendered	25 (61)	25 (78)	0 (0)
Engages in back and forth conversation	33 (80)	28 (88)	5 (56)
Is recognizable	19 (46)	14 (44)	5 (56)
Has a proper name	9 (22)	7 (22)	2 (22)
Has special knowledge	8 (20)	4 (13)	4 (44)
Predicts the future	10 (24)	8 (25)	2 (22)
Appears in dreams	14 (34)	10 (31)	4 (44)
Is heard by others	10 (24)	8 (25)	2 (22)
Voices considered real	37 (93)	30 (94)	7 (78)
Items from the combined transcript			
Expresses emotion	8 (20)	6 (19)	2 (22)
Addresses the patient's doubts	7 (17)	5 (16)	2 (22)
Shows self-preservative reactions	6 (15)	4 (13)	2 (22)
Has force of command	5 (12)	4 (13)	1 (11)
Has "not me" content	5 (12)	5 (16)	0 (0)
Produces body sensations	8 (20)	8 (25)	0 (0)
Is perceived in multiple senses	5 (12)	5 (16)	0 (0)
Extends in time/space	5 (12)	3 (9)	2 (22)
Is explained by religion or folklore	14 (34)	13 (44)	1 (11)
Is validated by ideas of reference	6 (15)	6 (19)	0 (0)

tions. Subjects ranged in age from 17 to 68 years old (mean 36 ± 12.0). Patients' primary diagnosis by *DSM–IV* (American Psychiatric Association 1994) criteria included schizophrenia (*n* = 32), schizoaffective disorder (*n* = 2), affective disorder with psychotic symptoms (*n* = 3), and substance abuse (*n* = 4). In addition, secondary substance abuse diagnoses were seen in 5 cases (3 with a primary diagnosis of schizophrenia and 2 of affective disorder).

Statistical Analysis. Data analysis proceeded from descriptive statistics to a stepwise logistic regression analysis (LRA) to attempt to predict the dependent variable, "a patient's belief that the voices were real"—that is, not a product of a transient disorder of the patient's state of mind. Factors of age and gender were forced first into the equation. In our sample, two predominant groups clustered around those with a primary diagnosis of schizophrenia (*n* = 32) and those with either a primary or a secondary diagnosis of substance abuse disorder (*n* = 9). The rates at which patients endorsed the 20 phenomenological elements are described in table 1 by subset. Table 2 compares the original Aggernaes study (1972) with the current series. Although there were a number of differences between the two groups in the current series, the number of patients in the substance abuse group was modest and we decided against further analysis of this group. In the LRA the independent variables entered into the analyses of the schizophrenia group depended on the frequency of their presentation. For this group (*n* = 32) we entered all 12 factors that occurred in over 16 percent of the sample (see table 1 for details).

Results

How Do Voices Compare With a Real Person? If heuristic SM contributes to an individual's belief in the reality of the voices, the subjective experience of the hallucination should closely approximate an auditory percept. This series confirms this expectation. All but one patient reported that voices had the subjective quality of an auditory percept, replicating previous studies with the same result. In addition to this basic perceptlike quality, patients reported nuances of vocal timbre that further personified and individuated their voices. Sixty-one percent reported voices with a distinct gender. Forty-six percent believed they recognized at least one of their voices as a specific friend, family member, or acquaintance. One patient heard a voice during the interview she had never heard before that had the vocal quality of the interviewer, suggesting that hallucinations may in immediate time spontaneously mimic the vocal quality of a new acquaintance. Twenty-two percent (9/41) said they did not know the voice in real life but reported that the voice had a proper name, which seemed to lend an individual personhood to the voice. In several cases the voice told the patient its name, as would a person introducing him- or herself to another for the first time.

In addition to the individuating and personifying elements noted above, 80 percent of patients (33/41) reported back and forth conversations with their voices. Most patients seemed to take these personified and interactive elements for granted rather than offering them as proof of the reality of the voices. In two cases, however, patients did clearly and directly refer to the interactive capacity of the voices as direct evidence of their reality. For example, Patient 29 (Pt 29) observed that after cutting himself in response to his voices, the voices would "quiet down" for several hours. "It seems like they're really there. If I cut myself after their commands they leave me alone. I mean it is like they're real." Pt 34 stated, "They are not imaginary. They see what I do. They tell me that I'm baking the cake. They must be there. How would they know what I'm doing?" Ninety-three percent (38/41) of patients reported

Table 2. Comparison of current series with Aggernaes (1972)

		Current Series		
Aggernaes criteria	Aggernaes (1972) (*n* = 41) *n* (%)	Entire sample (*n* = 41) *n* (%)	Schizophrenia subsample (*n* = 32) *n* (%)	Substance abuse subsample (*n* = 9) *n* (%)
Sensation vs. idea	38 (93)	40 (98)	32 (100)	8 (89)
Behavioral relevance	34 (83)	39 (95)	32 (100)	7 (78)
Publicness	12 (29)	10 (24)	8 (25)	2 (22)
Objectivity	32 (78)	18 (44)	5 (16)	0 (0)
Existence	36 (88)	Not rated	Not rated	Not rated
Involuntarity	34 (83)	40 (98)	32 (100)	8 (89)
Independence	40 (98)	37 (90)	30 (94)	7 (78)

either interaction with their voices, some personification of the voice as noted above, or both. Thus, a distinct majority of patients reported voices that sounded like and or acted as would a real person.

Most Patients Believed Their Voices To Be Independent Entities. Taking the Aggernaes concept of Independence as the single criterion best reflecting what clinicians mean by lack of insight reflected in a belief in the reality of the voices, 37 patients (90%) regarded their voices as independent of an unusual, transient change in state of mind that the patient would associate with a mental illness (compare 98%, Aggernaes 1972). At times patients reported being unsure about the reality of their voices early in their illness, but few were actively debating their reality at the time of the interview. Only 4 patients (10%) maintained that their voices were not real. Within this small subgroup, none alluded to an awareness of cognitive processes resulting in hallucinations to explain their belief that the voices were not real. Pt 41 said his voices might be related to drug use but could not explain why. Pts 19 and 33 hallucinated continuously for extended periods and actively engaged in arguments with their voices. These patients interacted with their voices as if they were real while contending they were not. In both cases this seemed to reflect a battle posture, where to concede the reality of the voices would be to concede defeat in their struggle. Pt 36 also experienced persistent voices. He concluded the voices were not real because "they came out of the air" and "no one else could hear them." Also, his family regularly reinforced that the voices were a "sickness."

Patients who initially doubted the reality of their voices succumbed to a belief in their reality. Of the 37 patients who considered their voices independent entities, several said they initially thought the voices could not be real, or they had been told the voices were not real, but concluded in the end "they are real to me." For example, Pt 23 heard the sound of buses and derogatory voices. He said he knew the buses could not be in his head and therefore they could not be real, and so maybe the voices were not real either. But he in the end reaffirmed his belief: "They are pretty real to me." These findings are consistent with independent source monitoring processes reaching different and contradictory conclusions about the reality of the voice (split decisions). In some cases, attitudes toward the reality of the voice changed as the patient's conflicting motives changed, a finding consistent with systematic SM. For example, Pt 26 heard the voice of a baby. She hesitated to say the baby was real because she said she would then have to worry about its need for care: "She's like my imaginary baby. She's real to me in some senses. I love her." She considered the baby real when this served her emotional needs, imaginary when it did not.

Several patients had at one time conducted experiments to test the reality of their voices. In the end patients concluded the voices were real even when the results of their experiment would not necessarily confirm this conclusion. For example, Pt 3 at first did not think it was possible for the neighbors to be communicating his thoughts back to him in voices, but when the voices persisted for days he began to wonder whether they might be real. He conducted a test by going back to his apartment. If he did not hear the voices again he would consider them transient and therefore imaginary, he resolved. He did hear them again and concluded they were real. Needless to say, this is not the only possible inference to be drawn. Experiments of this sort had the outward appearance of an impartial investigation one might expect in normal systematic SM but did not lead patients to conclude that the voices were self-generated.

Other Factors Mentioned to Account for a Belief That the Voices Are Real. As anticipated, patients rarely offered a clear, straightforward explanation of their belief in the reality of their voices. Nevertheless, when patients were asked if they thought of their voices as real or as part of their mind, when explaining their belief patients spontaneously mentioned a variety of characteristics possessed by the hallucinations. These characteristics included the voices commanding information, predicting the future, appearing in dreams, expressing emotion, showing self-preservative reactions, directly addressing the patient's doubts, having force of command, having a "not me" content, having a physical manifestation (including having physical sequelae, being manifested in multiple senses, or extending in time and space), being explained by religion or folklore, and being validated by ideas of reference. A complete list with frequencies is provided in table 1. These characteristics require elaboration.

Commanding information. Voices were frequently seen as commanding information about the patient. Twenty percent (8/41) of voices possessed special knowledge of the patient, in many cases information known by very few people or the patient alone. Possession of information was taken as evidence of the reality of the voices. When the voice knew something about the patient only the patient could know, the stature, power, and presence of the voice appeared to be enhanced. Patients seemed to infer, "If the voice is in possession of accurate facts, how can the voice itself not be factual?" For example, Pt 15 reported a voice who knew details of her rape, even though she had never told anyone else these details. Pt 11 heard voices he thought to be his neighbors who knew things about his childhood he had never told them. Perhaps related, Garety and Hemsley (1994) found that when delusional subjects pointed to actual events as evidence that their delusional beliefs were true, very few

could allow that the event might have happened while their inference about the event might be false.

Predicting the future. Twenty-four percent (10/41) of patients believed their voices could predict the future. The ability to make accurate predictions about the future is a fundamental measure of how well a theory corresponds to reality. Similarly, the ability to predict reality seemed to imply for some patients that the voice was in close contact with reality—that is, was itself real. For example, Pt 16 reported that the voices predicted an automobile accident involving her son. This patient routinely asked her voices to tell her when her boyfriend was coming to visit and to predict the weather. Pt 2 was told when her welfare check would arrive. Pt 27 heard a voice telling him that his doctor would be unable to draw his blood. The prediction proved true.

Appearing in dreams. Thirty-four percent (14/41) of patients reported voices in their dreams, or voices that awakened them from sleep. The presence of voices in dreams and their knowledge of dream content seemed to testify to the special powers of the voices and thus indirectly to their real presence. The conclusion seemed to be that if the voices know facts, they must be in touch with reality and therefore must be real. Pt 5 reported, "She knows my dreams. Like when I dream at night she says, 'I heard your dream.' She'll repeat what I dreamed. She knows my dreams. It's so real." Pt 18 reported, "I hear [the voice] in my dreams, when I am trying to sleep—'Wake up! Take pills!'"

Expressing emotion. The voice may speak with emotion, suggesting that it has an emotional life (8 patients [20%]). Pt 8 heard the voice of her dead daughter crying when the patient refused to join her in the grave. Pt 6 was told she could not go on a pass to a party she hoped to attend. "They told me I couldn't go to the party. I got upset and it got [the voice] upset too, because we both was gonna' go to the party."

Showing self-preservative reactions. An organism's instinct for self-preservation is a basic attribute of life. Occasionally a voice appeared to knowingly respond to efforts to eliminate it or diminish its power. Six patients (15%) reported such a self-preservative vigilance in their voices. Pt 6 reported that when she visualized her voice Barry in her mind after 2 weeks on medication one of his arms had been "eaten off." The patient told the interviewer, "I think the medication ate it off. Too bad it can't eat his whole body!" At that point in the interview, as if reacting to the neuroleptic as a threat, the voice began urging her to refuse her medication. Pt 5 asked, "If [the voice] really wanted to kill me, wouldn't she have done it by now?" When the interviewer agreed, the voice sprang to life, saying, "I have the power! Don't ignore my wishes!" The voice appeared to be monitoring the conversation, responding to an attempt to diminish its power.

Directly addressing the patient's doubts. Seven patients (17%) reported that the voice registered their doubts about its reality and addressed them directly. Pt 16 heard voices telling her she was growing horns and a tail. She put her hands on her forehead but felt nothing. The voices immediately explained, "They are invisible." The voices appeared to be aware of the patient's attempt to test reality, quickly countering the evidence of her sense of touch. The patient was persuaded that she was growing horns even though she could not feel them. Pt 12 was at first skeptical that the voice she heard was the singer Michael Jackson as it claimed. "I asked him, 'Is that really you?' The voice said, 'Yeah! Why don't you believe me?'"

Having force of command. Five patients (12%) reported their voices as so loud, forceful, or intrinsically compelling as to allow no doubt about their reality. Pt 29 reported, "The very domineering voices are almost like Laurence Olivier and Richard Burton. Very commanding voices." Pt 13 stated, "God's voice was so strong. He said 'If you don't listen to me, I'll be so disappointed.' I must do it." Pt 30 thought the voices were real in part because they could command him to do things, like look up at the sky when he did not want to. The power to command implied a real presence.

Having a "not me" content. Five patients (12%) concluded that the voice must be someone else because the content or form of the hallucination was not typical of themselves. Pt 8 speculated that the voice she heard might somehow be her own but rejected this idea: "I don't know how to explain it. Maybe it's me. But I wouldn't call myself 'Mommy'." Pt 17 heard "talk in his mind" exclusively in English, which he found baffling because Spanish was his native language. "I am Spanish. I'm not supposed to talk in English." This led him to conclude that an English-speaking entity was "stealing his brain." Pt 37 heard a voice telling him knock-knock jokes. "Stupid, ridiculous jokes. That's not me." Pt 2 at first thought the voices might be her imagination but came to believe they were not part of her because they were capable of a viciousness she had never seen in herself.

Having a physical manifestation. Thirteen patients (32%) reported the direct sensory experience of at least one physical manifestation of the voice that in addition to its auditory presentation testified to its reality. Of these 13 patients, 8 (20%) reported body sensations as evidence of the physical presence of the voice. For example, Pt 9 reported that she often had a migraine before she began to hallucinate. "That's why it seemed so real to me. Because it was not only abstract, but something also physical." Pt 11 believed her nosebleeds resulted from the pressure of her voices. Of these 13 patients, 5 (12%) reported hallucinations in multiple sensory modalities, which gave cre-

dence to the reality of the voice. Pt 13 heard God's voice and felt God take her hand at the same time. Pt 17 reported, "She [the voice] pushed me! Maybe my brain did it, but then how could I feel it push me?" A different group of 5 (12%) patients, while not experiencing a direct physical manifestation of the voices, did report the voices as having extension in time or space, which contributed a sense of reality to the voice for these patients. For example, Pt 32 reported that at first he heard voices only near his parents' house, which led him to conclude that the voices were physically located there.

Being explained by religion or folklore. Fourteen patients (34%) made reference to religion or folklore to justify their beliefs. In ideas about God, spirits, and ghosts, patients found ready metaphors for contact with a world beyond ordinary experience where the superficial appearance of things masks a deeper meaning. Patients familiar with the Bible and religious figures said to have heard the voice of God often identified their hallucinations as their personal experience of events already documented as "real" in scripture.

Being validated by ideas of reference. In some patients, ideas of reference (a feeling that events with a special personal meaning are converging on the patient) seemed to create a domino effect of conviction. As events appeared to repeat with the same meaning, patients seemed to reason, "If it happened once, I could write it off as a coincidence. But I see it happening all around me, again and again. It must be real." Six patients (15%) demonstrated this type of thinking. For example, Pt 1 described getting into bed with her husband: "I looked at my husband. One moment he was wide awake. The next moment he was fast asleep." She then heard the voice of Jesus and concluded that God had put her husband to sleep at that precise moment to allow her an uninterrupted conversation with Jesus. Her seeing the hallucination as having a place in a larger orchestrated sequence of events lent credence to its reality.

Statistical Correlations. In analyzing the results via LRA for the schizophrenia group ($n = 32$), we entered all the factors that occurred in over 16 percent of the sample to identify the cluster of factors that were associated with patients who experienced auditory hallucinations as being real (independent of a transient disturbance of their state of mind rather than self-generated). In this analysis, neither gender nor age, which were forced in that order into the equation, were significantly related to the factor of Independence. A total of 12 factors were examined; of these, only the factors of hallucinations expressing emotion ($p = 0.013$, beta $= 0.263$) and having a religious component ($p = 0.007$, beta $= 0.210$) significantly predicted the belief that hallucinations were independent of a tran-

sient mental state. The overall model accounted for 90 percent of the variance ($r = 0.959$) and was highly significant ($p < 0.0001$, f ratio 40.677).

Discussion

Heuristic SM—Similarities Between Voices and Real Speakers. With one exception, voices were reported as being like auditory percepts and so according to the SMF would be attributed to an outside source. In addition, voices often possessed sufficient nuances of vocal timbre to convey gender or mimic a particular person's voice and frequently engaged in back and forth conversations with the patient, as would a real speaker. How the voices interact is less easily classified as a potential focus for heuristic SM because the activity of the voice involves ongoing responses in real time as opposed to informational elements embedded in a memory. Auditory hallucinations convey information of a dynamic, interactive sort in addition to acoustic elements like vocal timbre. Here it seems useful to expand the definition of heuristic comparisons to include not only the perceptlike quality of the experience but all ways in which voices sound like, act like, or possess other qualities similar to real persons. In this larger comparison between voices and real speakers, voices at times appeared to know things as might a real person, to react, to show emotion, to directly address the doubts of the patient, to muster self-preservative reactions, and to speak with force of command (table 1). The acoustic, interactive, and personlike characteristics of voices may combine to pass what one might term an internal Turing test.

Patients are able for the most part to distinguish their voices from real speakers and their own thoughts (Davies et al. 1999; Leudar and Thomas 2000), which suggests that however similar voices are to real speakers, they are not experienced as identical. For this reason it cannot be said that patients fail to recognize voices as self-generated because they are identical to externally generated speech. The SMF does not require that two experiences have identical characteristics for an error to occur—only that they be sufficiently similar for confusion to arise (Mather et al. 1997). However, even with the expanded definition of heuristic elements noted above, it is difficult to see the voice possessing extraordinary knowledge about the patient (knowing dreams, special information, and the future) as offering a comparison with real speakers. Instead, these attributes suggest special capacities beyond the abilities of ordinary speakers that lend a superreality or surreality to the hallucination. Ordinary speakers do not possess these capacities, yet this comparison did not deter false belief, the opposite of what one would expect from heuristic SM. These findings parallel Chadwick and Birch-

wood's report (1994) that patients explain their belief in the omnipotence of their voices by pointing to "evidence," which includes the ability of the voices to know things, control the patient, and predict the future.

Systematic SM—Reasoning About Voices. At times, patients reported seemingly logical sequences of reasoning one might expect in the systematic SM of nonpsychotic individuals—for instance, attributing the voice to other than themselves because of "not me" content, as might ordinary people deciding that they could not have made a certain remark because it was unlike them. Another example would be experiments conducted by patients to ascertain the origin of their voices. Patients in this series who reasoned about their voices seemed to arrive at singular conclusions not because psychotic individuals are incapable of deductive thought (Williams 1964; Maher 1988; Kemp et al. 1997) but because they applied logical operators to narrow sets of data while excluding large amounts of information that would lead to a different conclusion. Perhaps one of the most obvious systematic SM strategies available to corroborate the reality of an event is to check whether others also experience it. In this series, 24 percent of patients believed their voices could be heard by others (76% believed their voices could not be heard by others). See table 2 for comparison with the Aggernaes data, which shows a similar result. It is striking that roughly three-quarters of patients did not believe others could hear their voices yet this did little to discourage false belief. Leudar and Thomas (2000) argue that voice hearers' knowing others cannot hear their voices shows intact reality testing. While this is true in a limited sense, patients failed to extend this observation to the conclusion that if no one else hears the voices, they must be an aspect of their own mind. In our view, the pseudological sequences seen in patients in this series mask underlying disturbances in the inferential processes that normally support systematic SM. Ironically, if patients rely on systematic SM processes they have come to trust to define reality while they are unaware these processes have been corrupted, seemingly logical inferences may provide rationales that deepen delusional beliefs rather than correcting them. Studies of the SMF in normals show that people weight information differently, depending upon their mental set (Johnson et al. 1998a). One might argue that delusion formation is simply an extreme example of this special weighting of information—that is, the delusional patient gives no weight to everyday facts most people take for granted. Such an extension of the SMF to psychosis may frame the problem but does not elucidate it. Systematic SM in normals compares the experience being monitored with an individual's preexisting belief system. It is the relative stability of this belief system that makes systematic SM possible in the first place. Systematic SM errors in normals do not transform beliefs about the world that serve as the standard by which new experience is judged; psychosis radically alters this standard. Delusional patients ignore facts they have known their whole lives (Chapman and Chapman 1988).

Two factors—religious explanations and emotion in the voice—emerged from the quantitative analysis as significantly correlated with a belief that the voices were real. However, this finding must be regarded with caution. The fact that 37 of 41 patients considered their voices real greatly limits the value of a statistical analysis that attempts to identify specific factors correlated with this belief. Religion offers ready-made culturally validated beliefs in unseen forces and entities external to the self, which may account for the prominence of religious explanations in this sample. As for emotion, Deegan (1996) makes special note of the compelling emotional valence of voices. Emotion is often associated with what is most genuine in people and so may contribute to a belief in the authentic personhood of the voice (Johnson et al. 1996).

As noted previously, patients are generally able to distinguish between their voices, the voices of real people, their own auditory images, and their own thoughts. Individuals not otherwise mentally ill who hear voices do not appear to suffer from a global inability to distinguish internal from external events (Posey and Losch 1983; Posey 1986; Romme and Escher 1989; Honig et al. 1998). These observations suggest that auditory hallucinations may not issue from a global deficit in source monitoring but a more circumscribed process that generates a new category of experience that blends elements of perception and thought but remains distinct from both—a novel input into source monitoring systems. Over time, patients may acclimate to their voices, accepting them as a separate and distinct type of experience, real in the sense that voices *really occur,* as do a variety of other distinct mental experiences, such as dreams, hypnogogic phenomena, and inner speech. The subjective anchor for this new type of experience would appear to be its perceptual quality, which lends a primary realistic character to the voice. This primary realistic quality may then be reinforced by personified and interactive attributes of the voice (table 1) sufficient to construct not a perfect replica of a person but one in many cases functionally sufficient to sustain an emotionally cathected interpersonal relationship with the patient. The heuristic similarity between the voice and a real speaker would appear to be a necessary but not sufficient condition for believing the voices are real. A second factor is required—a failure of systematic SM to correct the false belief.

Implications for Theories of Hallucinations. Several patients reported knowing the voices could not be real but

believing they were anyway (split decisions). Patients may report believing a delusion while knowing at the same time that their belief is false (Bowers 1974). The SMF accounts for split decisions. While there is experimental evidence for the intentionality model (Blakemore et al. 2000), split decisions would require subjects to know they intended an act and not know it at the same time. The intentionality model does not readily account for interactive dialogue. There is some evidence in this series that dissonant thoughts (Morrison et al. 1995) experienced as "not me" content may be a substrate for auditory hallucinations, but many patients spontaneously underscored that the voices said exactly what they were thinking or intended to say. In addition, the perceptual quality of the hallucinatory experience argues against the voice being merely a dissonant thought. If dissonant thoughts were to emerge unaccompanied by a person's awareness of the cognitive processes that generated them, the SMF would predict a tendency to attribute them to an outside source, an explanation perhaps more germane to the psychotic symptom of thought insertion than auditory hallucinations per se. The majority of patients conducted back and forth conversations with their voices. These dialogues, while often simple, repetitive, and mundane, seemed to reflect coordinated speech activities with an ordered, alternating reciprocity rather than unidirectional errors of speech production. The surprising range of humanlike capacities possessed by voices, including the seeming ability of some voices to accurately read interpersonal situations and accurately respond to the implicit intent of the patient or the interviewer, suggests involvement of fairly high-level speech and language centers able to reflect the immediate social context in what the voices say. Findings in the current study are most consistent with the following points of view: the interpersonal emphasis of Benjamin (1989); voices as dialogue in inner speech as described by Leudar et al. (1997), Davies et al. (1999), and Leudar and Thomas (2000); and Hoffman and McGlashan's (1998) more recent emphasis on hallucinations as aberrant speech perception; and David's (1994) suggestion of an ectopic speech generator.

Limitations of the Current Study. This study is a first attempt to describe how the SMF accords with naturalistic reports of auditory hallucinations. What is gained in scope and discovery in an open-ended interview must be balanced against what is lost in the absence of a validated instrument. As would be expected from an acute inpatient sample, nearly all the patients in the study had poor insight. A study design that employed two matched samples of equal size that differed only in their belief about the reality of their voices might allow a better statistical discrimination of factors associated with poor insight. Other aspects of our study would benefit from further refinement. Rating transcripts for the presence of

Aggernaes criteria differ in important ways from his original methodology. Our interviews and analysis focused on ways the voices might be similar to rather than different from real speakers and thoughts. Exploring such differences might have produced additional information relevant to our conclusions. While the SMF may offer some understanding of why patients believe their voices are real, the SMF and this study shed little light on another fundamental question: What is the nature of the speech generator producing the hallucinations, and why are its products experienced as percepts?

Conclusion

The SMF suggests useful ways of organizing and interpreting numerous aspects of naturalistic reports of auditory hallucinations but does not account for all the phenomena observed.

- Voices sound like real speakers and so according to heuristic SM would be attributed to an external source. The near-universal experience of the voice as being like an auditory percept is consistent with perception playing a fundamental role in creating the belief that an experience is real. This is in keeping with our deepest common-sense intuition that what we perceive is real, as when we say, "But I heard it with my own ears!"
- Voices often seem to possess a variety of human qualities, including the ability to interact with the patient. The acoustic properties of the voice, its personlike attributes, and its capacity to interact with the patient may be sufficient to sustain an emotionally cathected interpersonal relationship between the voice and the voice hearer.
- Systematic SM processes similar in outward appearance to those of normals do occur in hallucinators but almost never lead to the conclusion that the voices are self-generated. Systematic SM is credited when it supports a belief in the reality of the voices and discounted when it does not. Patients may seem to reason logically but exclude crucial information from consideration and reach erroneous conclusions. The systematic SM disturbance in hallucinators differs from systematic errors in nonpsychotic individuals in the radical transformation of stable beliefs about the world that ordinarily serve as the underlying foundation of systematic SM judgments.
- Voices often have a rudimentary interpersonal competence that operates in immediate time, suggesting the involvement of relatively high-level speech and language centers.
- A comprehensive theory of auditory hallucinations should aim at explaining how an aberrant speech generator with a rudimentary interpersonal competence pro-

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duces speech outputs that are loosely coupled with the patient's own thoughts, which are experienced not as thoughts but as percepts.

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