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Language-Related Symptoms in Persons with Schizophrenia and How Deaf Persons May Manifest These Symptoms

DEAF PERSONS requiring social services have historically been served primarily by educational institutions or departments of rehabilitation. Only in the last several decades have mental health service providers begun to respond to the Deaf community's requests for appropriate care and treatment. Largely because of this historical lack of input from mental health specialists, many of the individuals who treated or served Deaf persons were knowledgeable about Deaf cultural issues but were unfamiliar with clinical features of certain severe illnesses, such as schizophrenia. Concomitantly, psychiatric clinicians providing mental health services to Deaf persons have often lacked a

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strong background in the cultural and linguistic issues related to deafness. In particular, very few clinicians and research investigators have been knowledgeable signers. This lack of facility in sign language can be a serious obstacle to the accurate diagnosis and successful treatment of disorders in which language plays an important role.

Among the principal diagnostic criteria for schizophrenia, at least two—disorganized speech and hallucinations (when auditory—linguistic)—are related to language processing and production (American Psychiatric Association 1994). In the past, nearly all the observations about schizophrenic language have come from studies of hearing individuals and their production and comprehension of speech. In recent years, however, this situation has begun to change. Accounts of signing in schizophrenic patients who are deaf are starting to appear (Thacker 1994).

Deaf persons who communicate primarily through signs are represented in the approximately one percent of the total population that is identified as schizophrenic. Indeed, there is some evidence of a slightly higher incidence of schizophrenia among deaf persons than in the hearing population (Altshuler and Sarlin 1962; Remvig 1969). This estimate, however, may simply reflect the longer psychiatric hospitalizations that Deaf patients typically experience (Altshuler and Abdullah 1981) rather than an actual difference in the prevalence of schizophrenia between deaf and hearing populations. A major factor contributing to longer hospital stays for Deaf patients has been a therapist—patient communication barrier that made evaluation and treatment extremely difficult (Altshuler and Abdullah 1981). Communication barriers may also result in longer hospital stays for many Deaf patients with schizophrenia because they may preclude the establishment of a close and effective social support network (Schoener et al. 1999). Prevalence rates of schizophrenia among Deaf persons may also be inflated by misdiagnoses based, in part, on language symptoms whose etiology is not related to schizophrenic processes but instead to the effects of delayed or deprived language acquisition (Kitson and Fry 1991). Without an increased understanding of how schizophrenic language symptoms are manifested by Deaf persons, it is unlikely that the problems of diagnosis, treatment, and lengthy hospital stays will be resolved soon.

The purpose of this article is to review some of the core features of the disorganized speech seen in schizophrenia and to illustrate how Deaf persons with schizophrenia may display such language anomalies. We begin the article with a brief discussion of the difficulties involved in studying schizophrenic language in general and of schizophrenic signing in particular. We then examine many of the specific language-related symptoms of schizophrenia. In the course of this examination, we supplement previous findings based on analyses of spoken language with observations of how schizophrenia-related language disorders may be expressed in Deaf persons' signing. Although it is not yet possible to claim that the patterns of schizophrenic language disorders are equivalent across language modalities, there are many similarities or parallels in the speech and signing deficits observed in persons with schizophrenia. We conclude the article with recommendations for future clinical research.

Difficulties in Studying Schizophrenic Language

A principal difficulty in studying schizophrenic language processes is the wide variety of language-related symptoms both across individuals and within individuals across time (Andreasen 1979b). Within the current diagnostic criteria for schizophrenia, there is great heterogeneity in language presentation. For example, the symptom of disorganized speech, characteristic of other forms of schizophrenia, is not as prominent in the paranoid type (American Psychiatric Association 1994). Furthermore, because the illness of chronic schizophrenia is often marked by a sequence of acute phases and remissions, any individual's symptoms, including those of language, can change over time. As a consequence, many individuals with schizophrenia may be entirely lucid some of the time but not at other times. This lack of consistency in the display of language atypicalities complicates any depiction of "schizophrenic language."

Not only may language-related symptoms vary among persons with schizophrenia, but those language patterns most frequently associated with schizophrenia can also be observed in other psychotic processes, such as mania (American Psychiatric Association 1994). With few exceptions, the presence of language abnormalities alone does not discriminate schizophrenia from other psychotic disorders

(Andreasen 1979a, 1979b). Language symptoms characteristic of both schizophrenia and other psychiatric disorders may reflect cognitive processes common to those disorders (Oltmanns et al. 1985).

In their duration, however, schizophrenic language symptoms generally differ from those of other groups of psychiatric patients. In contrast to manic patients, whose language improves with their recovery from psychosis, most patients with schizophrenia retain some residual language deficits even during their remission from psychotic episodes (Andreasen 1979a, 1979b, 1982). There is also evidence that schizophrenic language symptoms differ in their severity from those of other psychiatric disorders. During psychotic episodes, schizophrenic language production often becomes more disordered than manic speech, and the speech of persons with schizophrenia typically contains fewer structural links to facilitate communication of meaning (Wykes and Leff 1982).

Diagnostic difficulties arise not only from the heterogeneity of schizophrenic language and its similarities to the language of other psychotic patients but also from the context in which language samples are obtained for evaluation. The social context in which language occurs can affect its semantic, syntactic, and phonological content. Although most language is in the form of dialogue rather than monologue and thus reflects an interaction between speakers, the majority of studies of schizophrenic language have confined themselves to evaluations of schizophrenic monologue. Little consideration has been given to the role of others in conversations with patients with schizophrenia, except in observations of how persons with schizophrenia respond to specific stimuli, such as direct questions (Andreasen 1979a, 1979b) or word-association tasks (Allen 1990). This monological bias may be a serious limitation when considering pragmatic aspects of schizophrenic language. Of course, in light of the relatively small proportion of schizophrenic patients who are deaf and the small number of clinical staff members with signing skills, there may not be many opportunities to obtain samples of schizophrenic signing in dialogue form.

A final issue in the study of schizophrenic language processing is the nearly universal presence of antipsychotic medications in the history and current functioning of patients with schizophrenia. Given

the apparent superiority of antipsychotic medications over other therapies in treating schizophrenic symptoms, most patients with schizophrenia have been exposed to antipsychotic medications at some time during their disease and are likely continuing a regimen of such medications during their participation in scientific studies. Therefore, it is difficult to separate completely the effects of schizophrenia from those of the medications and/or of the interaction of the disease with the medications on language processing.

Difficulties Associated with Studying Language Processing in Deaf Persons

Before discussing the characteristics of schizophrenic language in more detail, it is important to acknowledge that Deaf persons may manifest communication deficits or atypicalities for reasons other than mental illness. One source of difficulty is that a number of deaf children experience considerable language deprivation during childhood, a period crucially important for normal language development. More than 90 percent of deaf children have hearing parents (Schein and Delk 1974), and many of these parents historically have elected oral-only early education programs for their deaf children (Meadow 1980). These children frequently fail to acquire facility in speech and, probably because of their late introduction to signing, may not achieve fluency in a recognized sign language (Mayberry 1994). In turn, this lack of fluency in any language mode may convey the impression of language use indicative of mental illness when the real problem is inadequate language-learning opportunities.

Another potential source of diagnostic difficulty is that certain prenatal or perinatal insults to the brain that cause deafness may, in some cases, also damage other parts of the brain. Such damage to the brain may create language deficits or disorders that resemble those seen in persons with schizophrenia when schizophrenia is not at all involved.

Finally, an additional source of difficulty in diagnosing schizophrenia in Deaf persons is that there are few resources to guide the psychiatric clinician unfamiliar with the unique characteristics of the Deaf population. At present, research on signers with schizophrenia is scant; only a single rather preliminary investigatory report that focuses primarily on the sign language of prelingually deaf persons with

schizophrenia exists (Thacker 1994). Because very few clinicians and researchers are knowledgeable signers, they frequently must rely either on their own impressionistic accounts or the assessments of knowledgeable signers who may lack clinical training. Fortunately, as sign language training has become more widespread, this situation appears to be improving.

Expressive Language Symptoms of Schizophrenia

Studies of the speech of patients with schizophrenia have shown that the speech-related symptoms vary considerably in frequency. Derailment, loss of goal, poverty of content, and tangentiality are the most frequently identified symptoms. These are followed by poverty of speech and, finally, by pressured speech and perseveration. Some of these characteristics or symptoms, however, occur frequently in other groups of patients. Only poverty of content and tangentiality reliably differentiated schizophrenic from nonschizophrenic patients (Andreasen 1979a, 1979b).

Poverty of speech refers to restricted or limited amounts of spontaneous speech. Patients with schizophrenia typically produce shorter and fewer utterances and hence fewer words than do comparison groups consisting of manic-depressive patients and normal controls (Sanders et al. 1995). Moreover, this relative dearth in language production is amplified in patients with chronic schizophrenia (Ragin, Pogue-Geile, and Oltmanns 1989). Reduced overall verbosity thus appears to be a primary disturbance in schizophrenic language.

Poverty of content of speech refers to restricted or limited speech content when the amount of speech is adequate. Poverty of content is usually identified in discourse that is either vague and overabstract or else is repetitive, overconcrete, and stereotyped (Andreasen 1979a). These characteristics may also be evident in Deaf patients. One hospitalized schizophrenic Deaf woman we observed typically expressed herself in a very limited, repetitive fashion. She frequently signed “HOME. SHHH. SHHH. FINISH.” In her signing, she never demonstrated complex communication skills as she failed to sign more than three or four signs at a time. Her form of communication, moreover, differed from that of cognitively and linguistically limited, but not mentally ill, deaf persons in the stereotyped manner in which

she signed. For example, she always signed the first “SHHH” with her right hand, then the second “SHHH” with her left hand, and then “FINISH” with both hands. In addition, this level of functioning represented a marked decline from her premorbid condition.

Although certain Deaf patients evidence poverty of thought content in their signing, therapists need to exercise caution in making such an evaluation. If the therapist is not a proficient signer but relies heavily on an interpreter, then the translation into spoken English may give the impression of disjointed language. This impression, in turn, may lead the therapist to make an erroneous characterization of “poverty of thought content” (Misiaszek et al. 1985). Correspondingly, there may be a similar problem when a Deaf client has severely limited signing skills (Cook, Graham, and Razzano 1993). Therefore, in such situations, corroborating nonlanguage information should be collected on a Deaf client’s behavior before making a diagnosis.

Even though the productive or expressive language deficits characteristic of schizophrenia are many and varied, a number of efforts have been made to organize the different language deficits into distinct groupings or categories. The principal approach this article adopts is based on the work of Barch and Berenbaum (1996). Using Levelt’s (1989) model of the cognitive processes involved in language production, Barch and Berenbaum constructed four general categories of schizophrenic language. Moreover, they were able to show that three of their four categories were empirically related to different categories of thought disorder.

Barch and Berenbaum’s first type of productive language deficit, which includes neologisms and word approximations, was associated with grammatical–phonological encoding deficits. The second type of language deficit they identified consists of derailment and non sequitur responses; this type of language deficit was associated with worse speech monitoring. Incompetent references, their third category of language deficits, were associated with disruptions in discourse planning. Their fourth and final category of productive language deficits common to schizophrenia consists of tangential responses. Unlike the other categories, tangential responses showed no significant association to any particular type of thought disorder.

Neologisms and Word Approximations

Although neologisms and word approximations do not constitute specific diagnostic symptoms of schizophrenia, they have often been noted in the clinical literature (Andreasen 1979a, 1979b). They are, however, far less common than other markers of schizophrenic discourse. In some instances, the derivation of these new or novel words or phrases is unclear, as in this example from one hearing patient: “I got so angry I picked up a dish and threw it at the geshinker” (Andreasen 1979a, 1320).

The generation of neologisms is not restricted to hearing patients, as we have observed Deaf patients using signs of unknown derivation and meaning. Interestingly, these neologistic signs typically are well-formed ASL signs. That is, these neologistic signs use acceptable ASL movements, handshapes, and locations but combine them in unique ways so as to create signs unknown to other signers. Neologisms are sometimes difficult to detect in Deaf patients because of the relatively large number of sign variants (or dialects) used by native signers in the United States. Differences in signs are found not only from region to region but also within cities if there has been more than one school for deaf students in that locality. Therefore, when a patient uses a neologistic sign for a concept, it may be accepted too easily as a regional variant. This possibility can be ruled out by checking the sign with native signers from the same locale.

Word approximations are related to neologisms, but have clearer derivations. Word approximations occur when existing words are used in new or unconventional ways or when new words are generated using conventional rules of word formation. For example, a hearing patient was reported to call gloves “handshoes” (although possibly from the German word for *glove*, “Handschuh”), and in another instance, a ballpoint pen was referred to as a “paper-skate” (Andreasen 1979a). We have also observed Deaf schizophrenic patients produce novel combinations of signs to create new signs and meanings. In light of the widely varying language background of many Deaf persons, apparent instances of word approximation should be identified with caution and be considered only a possible

indicator of language disorder. Regardless, neologisms and word approximations can contribute to the incoherence of schizophrenic language.

Derailment and Non Sequitur Responses

In derailment, spontaneous speech “derails” from one track of thought to another or from one frame of reference to another. Derailment is distinguished from the phenomenon of tangential speech in that tangentiality describes responses to queries, whereas derailment indicates changes of topic within spontaneous speech. When derailment is subtle, and discourse slowly drifts off topic without the speaker’s awareness, the phenomenon is known as loss of goal (Andreasen 1979a).

The deterioration of schizophrenic speech in a relatively substantial discourse, such as observed by Salzinger, Portnoy, and Feldman (1964), may reflect an underlying process of increasing attentional or discourse planning difficulties. Unlike normal discourse, which becomes more predictable and less repetitive as it progresses, schizophrenic discourse tends to become less predictable and more repetitive. One reason for the lack of cohesion in the speech of patients with schizophrenia is that short discourses on topics unrelated to the main discourse topic are often interspersed throughout a speech sample (Noël-Jorand et al. 1997). Repetition is a form of derailment in which discourse loses its initial focus and returns perseveratively to the same word or phrase. A simple example from a hearing patient is: “I think I’ll put on my hat, my hat, my hat, my hat” (Andreasen 1979a, 1320).

Another form of repetition that has often been found in schizophrenic speech is *echolalia*. Echolalia occurs when an individual repeats the words or phrases of a person who has spoken to him or her. If an interviewer says “I’d like to talk with you for a few minutes,” the echolalic speaker may say “Talk with you for a few minutes” (Andreasen 1979a, 1321). This phenomenon is not limited to the auditory–vocal modality. For example, Thacker (1994) found that some prelingually deaf patients with schizophrenia slavishly imitated their interviewer’s British Sign Language (BSL) signs, a phenomenon she named *echopraxia*.

Echolalia in hearing populations is more common among young than adult individuals with schizophrenia. Because echolalia is also common among children with autistic disorder, some of the instances of echolalia found among young individuals with schizophrenia may represent language processes similar to those present in autism or some diagnostic confounding of autistic disorder and schizophrenia (especially given autism's previous label of "childhood schizophrenia"). Instances of repetition or echolalia in schizophrenic speech, however, are neither related to intellectual limitations nor are they the consequence of restricted vocabulary, as the words and phrases repeated by individuals with schizophrenia are generally less common, although not necessarily bizarre or unusual (Manschreck et al. 1985).

Analysis of the speech of hearing patients with schizophrenia has resulted in the identification of another form of repetitive speech, *object chaining*. Object chaining refers to a tendency to chain a series of object nouns together at the ends of sentences; this results in a high object-noun-to-subject-noun ratio (Maher, McKean, and McLaughlin 1966). An example of this phenomenon would be: "I don't think they were over comparing God, Abraham, Mongoloid, somebody . . ." (Manschreck et al. 1991, 443). Object chaining may represent another form of loosening of associations or derailment. Among Deaf patients such inappropriate chaining of object nouns must be distinguished from the appropriate use of the ASL (American Sign Language) linguistic device of chaining several exemplar objects to indicate a more general category (e.g., signing TABLE, CHAIR, etc. to convey the concept of furniture).

"Clanging," perhaps a more severe form of derailment, occurs when phonemic sounds, rather than meaning, determine the progression of the discourse. Clanging often takes the form of rhyming, and such rhymes can eventually overwhelm the semantic relationships between words, resulting in nonsense rhymes. In milder forms of clanging, puns, rather than rhyming, may occur:

I'm not trying to make noise. I'm trying to make sense. If you can make sense out of nonsense, well have fun. I'm trying to make sense out of sense. I'm not making sense (cents) anymore. I have to make dollars. (Andreasen 1979a, 1320)

Deaf patients with schizophrenia have demonstrated various errors in signing that resemble clanging among hearing patients with schizophrenia. The first involves cross-linguistic contamination. Thacker (1994, 820) observed errors that involved linking a BSL sign to its English homophone:

Interviewer: YOU SAY WOMAN INSIDE YOU HAVE? MEAN WHICH, BODY OR SOUL?

Schizophrenic patient: SOUL (conventional sign) SOLE (pointing to bottom of foot) TWO FEET JUMP IN MY MOUTH.

We have also observed another approximation to clanging in Deaf patients with schizophrenia in which a formational aspect of a sign (the location, handshake, or movement), rather than the phonemes of speech, determines the progression of discourse. For example, a deaf patient might continue a sentence using a sign with a handshake similar to that of a previous sign rather than relating to the meaning of the sign.

Incompetent Reference

One of the most systematically examined aspects of the speech of patients with schizophrenia is the apparent lack of cohesion in their discourse that results from their use of unclear and ambiguous referents (Rochester and Martin 1979; Sanders et al. 1995). The apparent incoherence of schizophrenic language may, at times, represent faulty assumptions about the listener's frame of reference rather than being evidence of other cognitive or linguistic disturbances. For example, patients with schizophrenia, particularly those with positive symptoms, often use pronominal forms without clear referents (Allen and Allen 1985; Caplan, Guthrie, and Foy 1992; Harvey 1983; Harvey and Brault 1986). Similarly, patients with schizophrenia frequently seem to speak in non sequiturs as they fail to make clear associations between statements (Berenbaum, Oltmanns, and Gottesman 1985). However, as clinicians have worked with the same patients over time and become much better acquainted with the patients' frames of reference, previously unclear referents have often become more comprehensible (Bleuler 1950). This finding suggests that, at least in some

cases, schizophrenic language may be somewhat like children's egocentric speech, in which young children assume their listeners share their own frame of reference.

The difficulty involved in understanding schizophrenics' frames of reference and associations between statements is illustrated in our observations of a psychotic Deaf woman. As she approached the hospital staff, she signed "YELL." She had not yelled. After several repetitive exchanges of "Who yelled?" "YELL" and "Do you hear a yell?" "YELL," she led the staff to a male patient and signed "BOY YELL." In another instance, this same woman approached the staff and signed "FUTURE ME." It took multiple attempts at clarification before she revealed that her thought was "In the future, I will meet J——" (the boy who yelled).

In studies of schizophrenic speech, the frequency of incompetent referents has been found to be closely associated with the severity of thought disorder (Harvey and Brault 1986) and to be predicted by distractibility and deficient reality monitoring (Harvey and Serper 1990). Any relationship between the severity of thought disorder, distractibility, or deficient reality monitoring and developmental delays in referential understanding among patients with schizophrenia remains to be thoroughly investigated.

This issue is even more complicated in Deaf persons. Nonnative signers (clinicians or interpreters) can sometimes miss or misunderstand referents that are often expressed in ASL by subtle facial expressions or shifts in body posture. In addition, when deafness occurs in the context of a prenatal or perinatal insult, there is increased likelihood of damage to other brain areas as well. Sign language researchers have found that certain left hemisphere lesions can manifest themselves in the absence of index pronouns or lack of pronominal indices (Poizner, Klima, and Bellugi 1987). Furthermore, a number of deaf persons, because of their limited and late exposure to fluent signing, do not acquire the full range of ASL (or other sign languages used by deaf persons) grammatical rules (Mayberry 1994). (These individuals are sometimes referred to as visual-gestural Deaf persons or as having minimal language skills.) It may well require great familiarity with both the communication style of such visual-gestural Deaf persons and the language style of schizophrenics to differentiate between

the impoverishment or fragmentation of communication resulting from signing skill deficits and those resulting from schizophrenic processes.

Tangential Responses

In tangential speech, responses to questions may be oblique, tangential, or irrelevant. Tangential speech is similar to derailment except that it refers to a loosening of associations in response to specific questions rather than to those that occur in spontaneous speech. In general, the loosening of associations in schizophrenia presents identically in deaf persons and hearing persons except for the use of a signed language as opposed to spoken language.

As we have noted before, most service workers assisting Deaf persons are hearing and are not fluent signers. These workers often tend to blame their lack of comprehension on their own lack of signing skills rather than to recognize when a client may be having difficulty participating in a logical conversation. Working through an interpreter presents other problems in that a service worker may attribute illogical answers to difficulties in interpretation and not to the client's illogical thought process. Possible solutions to this dilemma may be to ask for the impressions of a fluent or native signer or to compare notes with other workers to determine whether they are also having difficulty "following" a particular client's train of thought.

Speaking and Signing Behavior

In addition to the categories of expressive language deficits delineated by Barch and Berenbaum (1996), the language of patients with schizophrenia differs from that of normal individuals in other important ways. One particularly noticeable difference is prosody. Prosodic aspects of language, such as intonation, stress, and rhythm, are also frequently disordered or unusual in patients with schizophrenia. Evidence of disorder of prosody as well as facial affect recognition is apparent in patients with chronic schizophrenia. In their studies of hearing patients with schizophrenia, Fricchione, Sedler, and Shukla (1986) found that prosodic deficits in spontaneous speech production, repetition, and auditory comprehension accounted for the majority of the language difficulties that the patients experienced. Furthermore, when in an acute state, patients with schizophrenia

tend to make longer pauses in their utterances, to speak more monotonously and in a low voice, and to shift their vocal pitch toward higher frequencies (Püschel et al. 1998). In contrast to these changes in speaking behavior, the comprehension of emotional gesturing was found to remain relatively intact in patients with schizophrenia (Haskins, Shutty, and Kellogg 1995). Our observations of Deaf patients with schizophrenia have revealed atypicalities in signing similar to those reported for the prosodic aspects of speech. Some Deaf patients signed overly fast, others much too slow. Still others would place too much emphasis on particular sign movements. The facial affect of the schizophrenic Deaf patients, moreover, was often not in accord with their sign communication and inappropriate for the situation.

Anomalies Unique to Signed Discourse

In addition to the disordered signing that resembles the disordered speech of hearing persons with schizophrenia, Thacker (1994) has identified various anomalies of schizophrenic discourse unique to signed languages. She identified *phonemic* (or *cheremic* in Stokoe, 1960, terminology) paraphasias in the signing of prelingually deaf patients with schizophrenia. These included reversals of signs (some patients made the movements of signs backward), fingerspelling backward, and making signs in the wrong locations. Thacker (1994) also observed one patient who associated the right side of her body with herself, and her left side with her brother. Her signing sometimes involved a dialogue between herself and her brother. Signs that would normally occupy a bilateral space were restricted to whichever side of her body was associated with her intended character.

Another way in which the communication of Deaf persons with schizophrenia may become uniquely impaired is through the limitations of expression that are symptomatic of schizophrenia. For example, among the negative symptoms of schizophrenia is blunted affect, a condition in which affective expression is considerably diminished. Given the extensive use of facial expression in signed languages, particularly to communicate varying meanings and intensities of meaning, it is possible that blunted affect may reduce the clarity of either the denotative or connotative meanings a Deaf patient with schizophrenia intends to convey through signs that normally require more precise expression of affect.

Receptive Language Deficits in Schizophrenia

In addition to abnormalities in language production, impaired language comprehension has often been observed in individuals with schizophrenia (Chapman 1960; Condray, Steinhauer, and Goldstein 1992; Cutting and Dunne 1989; Cutting and Murphy 1990; Faber and Reichstein 1981; Laws, Kondel, and McKenna 1999; Morice and McNicol 1985). Indeed, these patients themselves frequently notice a change in how they experience their own or others' speech; this occurs both on a semantic and a perceptual level. The following two examples underline this point:

I thought my language was wrong; I believed that no one could understand what I said; I couldn't understand what I said; just high-pitched noises came out; it lost its meaning; I *could* understand what others said. (Cutting and Dunne 1989, 221)

and

When people talk to me now it's like a different kind of language. It's too much to hold at once. My head is overloaded and I can't understand what they say. It makes you forget what you've just heard because you can't get hearing it long enough. It's all in different bits which you have to put together again in your head—just words in the air unless you can figure it out from their faces. (McGhie and Chapman 1961, in Rochester and Martin 1979, 18)

Such subjective accounts suggest both an excess of perceptual information beyond what can be processed systematically and a general tenor of disorganization and unreality in language perception. This deterioration of receptive language processing in schizophrenia may be considered from the perspective of both syntax and semantics.

Syntactical Understanding in Schizophrenia

A number of early studies of language processing in patients with schizophrenia examined whether syntactic relationships were understood by the patients. For many of the patients, syntactic relations remained relatively intact. In an investigatory approach involving clicking sounds embedded in discourse (see Fodor and Bever 1965), both the normal participants and those with schizophrenia were asked to repeat sentences with the clicks properly placed. Both

groups of participants showed a bias for placing clicks between meaningful phrases and clauses (Rochester 1973; Rochester, Harris, and Seeman 1973). This finding was interpreted as indicating that normal and schizophrenic participants alike utilize the syntactic organization of surface structure in decoding or processing sentences. Furthermore, both normal and schizophrenic individuals apparently utilized syntactic and semantic cues in remembering sentences and followed syntactic and semantic rules in grouping words (Grove and Andreasen 1985; Rochester and Martin 1979). Even in disordered speech, the units of speech tended to be preserved (Leff 1993).

Although patients with schizophrenia often maintain appropriate syntactic relations in their production of sentences that are semantically nonsensical (Andreasen 1979a, 1979b), they frequently have difficulty in comprehending complex grammatical structures (Condray et al. 1992; Thomas and Huff 1990). Patients with schizophrenia (and their siblings) also show poorer performance than normal individuals on tasks requiring auditory comprehension of complex grammatical structures (Condray et al. 1992), perhaps indicating some deficits in the sequential processing necessary for linguistic competence. Consistent with these findings, patients with early onset of schizophrenia, which is generally associated with greater severity of symptoms, showed reduced syntactic complexity in their speech production (Morice and Ingram 1983). At present, studies of syntactic processing in patients with schizophrenia have focused only on hearing individuals and their spoken language processing. Similar investigations have not yet been conducted with Deaf patients with schizophrenia.

Deficits in Schizophrenic Patients' Semantic Comprehension

There is some evidence that patients with schizophrenia have impaired access to word meanings (Laws et al. 1999), that they often prefer denotative to connotative meanings of words, and that they show less inclination to select metaphorical interpretations of ambiguous adjectives, even when such interpretations are appropriate. An example of preference of literal over figurative meanings is seen in the sentence, "David turned yellow when he faced the enemy," for which individuals with schizophrenia more frequently chose skin discoloration than cowardice in assessing the meaning of yellow (Chapman 1960). From this failure to apprehend metaphor, it has been

inferred by certain investigators that patients with schizophrenia may rely more on their left hemisphere lexicon in performing semantic tasks (Cutting and Murphy 1990) than do normal individuals. Indeed, damage to the right hemisphere has been shown to impair the comprehension of metaphorical statements such as “the man had a heavy heart” (Winner and Gardner 1977, cited in Cutting and Murphy 1990). Whether this difficulty in understanding metaphor is indicative of right hemisphere damage in persons with schizophrenia, problems in bilateral processing, or simply lower levels of cognitive functioning is not clear.

As the severity of their symptoms increases, patients with schizophrenia typically deteriorate in their ability to discern context-dependent meanings. When presented with a word-association task, schizophrenic patients with the most severe symptoms were quite likely to respond with words that were contextually inappropriate (Allen 1990). Patients with schizophrenia also showed diminished performance on cloze tasks (filling in the missing word) when given increasing amounts of contextual material (deSilva and Hemsley 1977). It is not clear from these studies, however, whether the schizophrenic patients’ frequent failure to benefit from context is the product of attention difficulties, atypical association strategies, or both. Regardless, similar studies might be conducted with Deaf schizophrenic patients to determine whether the same patterns occur in both populations and across language modalities. This deficit may be a particular problem for Deaf persons with schizophrenia as ASL makes considerable use of context to clarify the precise meaning of a particular sign.

Auditory and Verbal Hallucinations

Other language-related symptoms of schizophrenia include prominent hallucinations (American Psychiatric Association 1994), most frequently auditory hallucinations, and often specifically verbal hallucinations (Romme and Escher 1989; Rund 1986). Although the experience of “hearing voices” is not necessarily related to language deficits, verbal hallucinations may in some cases either exacerbate or be exacerbated by language-processing deficits.

There have been occasional reports over the past century of prelingually deaf patients experiencing auditory hallucinations

(Critchley et al. 1981; du Feu and McKenna 1999; Remvig 1969; Schonauer et al. 1998; Stearns 1886). Remvig (1969) provides several such accounts from deaf patients with schizophrenia.

During admission his behavior was indicative of his being hallucinated, i.e. his attention was intensely fixed, he seemed to be listening, and, at the same time, he would be moving his hands with extreme rapidity, as if in sign language. Following such an episode I had a conversation with him. This was for the most part carried on in writing, executed rapidly, legibly and apparently without misconceptions. He stated that he *heard voices*. These struck both his ears and it felt as if they were being breathed upon. The voices ordered him about. He was not able to say to whom they belonged. (1969, 116–17)

In another case, a nonspeaking deaf patient with schizophrenia reported that he experienced sensations that were “interpreted as vibrations that partly ‘hit’ his ears, partly the soles of his feet, the hollows of his knees and his body” (Remvig 1969, 117); he interpreted these vibrations as indicating that his neighbors were pestering him through sounds and noises. Another deaf patient claimed that “she felt herself to be under the influence of sound waves that she could feel against her cheek” (Remvig 1969, 118). Furthermore, these sound waves “spoke” to her by hitting her cheek with such force as almost to knock her over (1969, 118). Remvig continued his description of the patient:

These sensations are experienced by her as very vivid speech and they are at the same time, “memorized” by clearly expressed finger language. These movements appear to be “accompanying movements” akin to the mouth and throat movements seen in normally hearing persons during auditory hallucinations. (1969, 118)

These reports that deaf patients experience auditory hallucinations are striking in that they suggest that extensive use of speech and speech input is not necessary for such events to occur. Moreover, the deaf patients examined by Remvig (1969) reported that their tactile sensations were focused around the areas of their ears and cheeks and that they associated these sensations with communication, voices, and commands. It should be noted, however, that what these deaf patients are describing as auditory hallucinations or voices consists

primarily of feelings of vibrations or air currents. For these individuals, such experiences may have been associated with their efforts to learn a spoken language.

The findings of two recent studies (du Feu and McKenna 1999; Schonauer et al. 1998) of auditory hallucinations in prelingually profoundly deaf patients with schizophrenia, however, suggest that the auditory hallucinations reported by some deaf patients may actually closely resemble those reported by schizophrenic patients with hearing levels in the normal range. Ten of the 17 patients examined by du Feu and McKenna reported that they had experienced verbal auditory hallucinations and provided descriptions of the content of these episodes. Many of the patients were quite emphatic that they had heard voices and that they were not receiving information in some other way. In the Schonauer et al. (1998) study, 23 of the 67 participants recalled that they had heard human voices in auditory hallucinations. Moreover, some of the patients insisted “that their hallucinatory ‘perceptions’ conveyed to them the ‘true’ impression of hearing in a way which they never experienced outside their schizophrenic episodes” (1998, 381–82). If additional research confirms that some prelingually profoundly deaf patients with schizophrenia are indeed hearing voices, it is not at all clear what might account for such a phenomenon. Perhaps some deaf persons rely on a form of inner speech, and the reports of auditory hallucinations reflect a misattribution of the source of this “speech.”

Although on the surface the experience of “auditory” hallucinations among deaf persons seems like a paradox, it may be that Deaf patients are particularly vulnerable to auditory hallucinations. Indeed, studies of the antecedents to hallucinations have shown that auditory hallucinations are more likely to occur in conditions of low auditory input (sensory restriction and white noise) than normal or high input (Gallagher, Dinan, and Baker 1994). Because many Deaf persons have some residual hearing, their experience may be more similar to that of the low-input condition than that of persons with normal hearing levels.

Among hearing persons with schizophrenia, humming a single note softly was found to reduce self-reports of hallucinations by 59 percent (Green and Kinsbourne 1990). This finding suggests that

humming provides either some auditory distraction from the perception of auditory hallucinations or cognitive processes to compete with those that are responsible for auditory hallucinations. Clinical observations, moreover, have been interpreted as indicating that any oral activity, including drinking, can cause auditory hallucinations to diminish or abate (Forrer 1960). The exploration of how auditory pathways in the brain respond in the absence of sensory input, particularly in Deaf persons, may further illuminate our understanding of “auditory” hallucinations among schizophrenic patients who are deaf. Investigation into behaviors that cause hallucinations to abate may enhance our understanding of more general processes that govern auditory hallucinations.

In addition to the auditory and/or vibrational hallucinations just described, Deaf patients may experience visual hallucinations. The incidence of visual hallucinations in Deaf patients with schizophrenia, moreover, appears to be considerably higher than that reported for hearing patients with schizophrenia (du Feu and McKenna 1999; Schonauer 1998). One possible explanation for this difference in incidence level is that visual processing typically plays a much more important role in the communicative and cognitive functioning of deaf persons, especially among those individuals who have been deaf from birth or early childhood. Although some of the visual hallucinations consisted of such images as flashing lights or faces on the wall (du Feu and McKenna 1999), other reports of visual hallucinations included accounts of individuals signing or fingerspelling (Schonauer et al. 1998). Of the seven patients who told Schonauer et al. that they experienced such visual communication hallucinations, six were congenitally deaf, and the other patient’s onset of deafness could not be dated precisely. This tendency for hallucinatory visual communication to be largely confined to congenitally deaf individuals may indicate that early sensory experience plays a role in the nature of hallucinations. (It should also be noted that Remvig (1969) reported that some of the deaf patients he studied, who had been designated as experiencing hallucinations, talked with themselves manually during such episodes. Unfortunately, he did not pursue this topic in depth.) In the future, it might be important to compare the incidence and content of sign language hallucinations in congenitally deaf patients

with schizophrenia with that of hallucinatory spoken language in hearing patients with schizophrenia. In such analyses, it might be worthwhile to try to differentiate between those hallucinations that are primarily verbal in nature (sign or speech) and those auditory and visual hallucinations that are not language based. Finally, the incidence and type of verbal hallucinations experienced by deaf patients with schizophrenia might be found to vary depending on age at onset and degree of hearing loss, further identifying those characteristics critical for verbal hallucinations (Evans and Elliott 1981).

Concluding Remarks

Although the heterogeneity of schizophrenic symptoms creates some diagnostic problems in the study of schizophrenic language processing, investigations of thought-disordered patients with schizophrenia generally show consistent patterns of speech anomalies and comprehension deficits. Preliminary observations indicate the presence of many similar patterns of language atypicalities in the signing of Deaf individuals with schizophrenia. These similarities across language modalities, if confirmed, should not be viewed as surprising for two reasons. One is that cognitive processes appear to govern many aspects of language production and understanding; language and thought are intricately interrelated for both Deaf and hearing persons. The second reason is that numerous parallels or similarities across modalities have been identified for signed and spoken languages; there is no reason to expect that additional similarities will not be uncovered in the language use of persons with schizophrenia. It should be recognized, however, that the evidence for essentially equivalent schizophrenic language processes in sign and speech is not yet firmly established. Much more detailed and systematic research needs to be conducted by investigators knowledgeable in ASL and other sign languages before we can draw strong conclusions.

To accomplish such research, individuals with strong backgrounds in sign language linguistics need to collaborate closely with mental health professionals in both clinical and research settings. Fluent signers with expertise in sign language linguistics are probably needed to determine patterns of sign-formational atypicality, grammatical aberration, generation of neologisms, and discourse violation. Once these

and other types of linguistic dysfunction associated with schizophrenia are carefully documented, it should be possible to prepare videotapes of instances of such linguistic disorder to assist clinicians in their diagnoses in the future. Videotape records of schizophrenic patients' signing over time should also be made in order to help in the evaluation of the success of their therapy. In addition, universities with sign language programs might well be encouraged to expand their programs to include training on sign language disorders and deficits.

Research with Deaf clients with schizophrenia also promises to illuminate aspects of language processing implicated with schizophrenia. The sign production of Deaf persons with schizophrenia should also provide a new vantage point from which to examine deficiencies in sequential processing and discourse planning, attention deficits, and perhaps even atypical hemispheric processing patterns. Overall, the inclusion of schizophrenics who are deaf and the analysis of sign language atypicalities in studies of schizophrenic language should add important new information to our knowledge of schizophrenic language more generally. In turn, clinicians serving Deaf patients may become better at making accurate diagnoses and initiating successful treatment programs. Finally, researchers interested in the linguistic structure of ASL may find it fruitful to study how ASL breaks down in Deaf persons with severe mental illnesses.

References

- Allen, H. 1990. Cognitive Processing and its Relationship to Symptoms and Social Functioning in Schizophrenia. *British Journal of Psychiatry* 156:201-3.
- Allen, H., and D. Allen. 1985. Positive Symptoms and the Organization within and between Ideas in Schizophrenic Speech. *Psychological Medicine* 15:71-80.
- Altshuler, K., and S. Abdullah. 1981. Mental Health and the Deaf Adult. In *Deafness and Mental Health*, ed. L. Stein, E. Mindel, and T. Jabahey, 99-112. New York: Grune & Stratton.
- Altshuler, K., and B. Sarlin. 1962. Deafness and Schizophrenia: Interrelation of Communication Stress, Maturation Lag, and Schizophrenic Risk. In *Expanding Goals of Genetics in Psychiatry*, ed. F. Kallman, 52-62. New York: Grune & Stratton.
- American Psychiatric Association. 1994. *Diagnostic and Statistical Manual of Mental Disorders*. 4th ed. Washington, D.C.: Author.

- Andreasen, N. 1979a. Thought, Language, and Communication Disorders: I. Clinical Assessment, Definition of Terms, and Evaluation of Their Reliability. *Archives of General Psychiatry* 36:1315–21.
- . 1979b. Thought, Language, and Communication Disorders: II. Diagnostic Significance. *Archives of General Psychiatry* 36:1325–31.
- . 1982. There May Be a “Schizophrenic Language.” *Behavioral and Brain Sciences* 5:588–89.
- Barch, D., and H. Berenbaum. 1996. Language Production and Thought Disorder in Schizophrenia. *Journal of Abnormal Psychology* 105:81–88.
- Berenbaum, H., T. Oltmanns, and I. Gottesman. 1985. Formal Thought Disorder in Schizophrenics and Their Twins. *Journal of Abnormal Psychology* 94:3–16.
- Bleuler, E. 1950. *Dementia Praecox or the Group of Schizophrenias*. New York: International Universities Press.
- Caplan, R., D. Guthrie, and J. Foy. 1992. Communication Deficits and Formal Thought Disorder in Schizophrenic Children. *Journal of the American Academy of Child and Adolescent Psychiatry* 31:151–59.
- Chapman, L. 1960. Confusion of Figurative and Literal Uses of Words by Schizophrenics and Brain-Damaged Patients. *Journal of Abnormal and Social Psychology* 60:412–16.
- Condray, R., S. Steinhauer, and G. Goldstein. 1992. Language Comprehension in Schizophrenics and Their Brothers. *Biological Psychiatry* 32:790–802.
- Cook, J., K. Graham, and L. Razzano. 1993. Psychosocial Rehabilitation of Deaf Persons with Severe Mental Illness: A Multivariate Model of Residential Outcomes. *Rehabilitation Psychology* 38:261–74.
- Critchley, E., J. Denmark, F. Warren, and K. Wilson. 1981. Hallucinatory Experience of Prelingually Profoundly Deaf Schizophrenics. *British Journal of Psychiatry* 138:30–32.
- Cutting, J., and F. Dunne. 1989. Subjective Experience of Schizophrenia. *Schizophrenia Bulletin* 15:217–31.
- Cutting, J., and D. Murphy. 1990. Preference for Denotative as Opposed to Connotative Meanings in Schizophrenics. *Brain and Language* 39:459–86.
- deSilva, W., and D. Hemsley. 1977. The Influence of Context on Language Perception in Schizophrenia. *British Journal of Social and Clinical Psychology* 16:337–45.
- du Feu, M., and P. McKenna. 1999. Prelingually Profoundly Deaf Schizophrenic Patients Who Hear Voices: A Phenomenological Analysis. *Acta Psychiatrica Scandinavica* 99:453–59.
- Evans, J., and H. Elliott. 1981. Screening Criteria for the Diagnosis of Schizophrenia in Deaf Patients. *Archives of General Psychiatry* 38:787–90.

- Faber, R., and M. Reichstein. 1981. Language Dysfunction in Schizophrenia. *British Journal of Psychiatry* 139:519–22.
- Fodor, J., and T. Bever. 1965. The Psychological Reality of Linguistic Segments. *Journal of Verbal Learning and Verbal Behavior* 4:414–20.
- Forrer, G. 1960. Effects of Oral Activity on Hallucinations. *Archives of General Psychiatry* 2:100–3.
- Fricchione, G., M. Sedler, and S. Shukla. 1986. Aprosodia in Eight Schizophrenic Patients. *American Journal of Psychiatry* 143:1457–59.
- Gallagher, A., T. Dinan, and L. Baker. 1994. The Effects of Varying Auditory Input on Schizophrenic Hallucinations: A Replication. *British Journal of Medical Psychology* 67:67–75.
- Green, M., and M. Kinsbourne. 1990. Subvocal Activity and Auditory Hallucinations: Clues for Behavioral Treatments? *Schizophrenic Bulletin* 16:617–26.
- Grove, W., and N. Andreasen. 1985. Language and Thinking in Psychosis. *Archives of General Psychiatry* 42:26–32.
- Harvey, P. 1983. Speech Competence in Manic and Schizophrenic Psychoses: The Association between Clinically Rated Thought Disorder and Performance. *Journal of Abnormal Psychology* 92:368–77.
- Harvey, P., and J. Brault. 1986. Speech Performance in Mania and Schizophrenia: The Association of Positive and Negative Thought Disorders and Reference Failures. *Journal of Communication Disorders* 19:161–73.
- Harvey, P., and M. Serper. 1990. Linguistic and Cognitive Failures in Schizophrenia: A Multivariate Analysis. *Journal of Nervous and Mental Disease* 178:487–93.
- Haskins, B., M. Shutty, and E. Kellogg. 1995. Affect Processing in Chronically Ill Psychiatric Patients: Development of a Reliable Assessment Tool. *Schizophrenia Research* 15:291–97.
- Kitson, N., and R. Fry. 1991. Prelingual Deafness and Psychiatry. *British Journal of Hospital Medicine* 44:353–56.
- Laws, K., T. Kondel, and P. McKenna. 1999. A Receptive Language Deficit in Schizophrenic Thought Disorders: Evidence for Impaired Semantic Access and Monitoring. *Cognitive Neuropsychiatry* 4:89–105.
- Leff, J. 1993. Comment on Crazy Talk: Thought Disorder or Psychiatric Arrogance? by Thomas Szasz *British Journal of Medical Psychology* 66:77–78.
- Levelt, W. 1989. *Speaking: From Intention to Articulation*. Cambridge, Mass.: MIT Press.
- Maher, B., K. McKean, and B. McLaughlin. 1966. Studies in Psychotic Language. In *The General Inquirer: A Computer Approach to Content Analysis*, ed. P. Stone, D. Dunphy, M. Smith, and D. Ogilvie, 469–503. Cambridge, Mass.: MIT Press.

- Manschreck, T., B. Maher, M. Celada, M. Schneyer, and R. Fernandez. 1991. Object Chaining and Thought Disorder in Schizophrenic Speech. *Psychological Medicine* 21:443–46.
- Manschreck, T., B. Maher, T. Hoover, and D. Ames. 1985. Repetition in Schizophrenic Speech. *Language and Speech* 28:255–68.
- Mayberry, R. 1994. The Importance of Childhood to Language Acquisition: Evidence from American Sign Language. In *The Development of Speech Perception*, ed. J. Goodman and H. Nusbaum, 57–90. Cambridge, Mass.: MIT Press.
- McGhie, A., and J. Chapman. 1961. Disorders of Attention and Perception in Early Schizophrenia. *British Journal of Medical Psychology* 34:103–16.
- Meadow, K. 1980. *Deafness and Child Development*. Berkeley: University of California Press.
- Misiaszek, J., J. Dooling, M. Gieseke, H. Melman, J. G. Misiaszek, and K. Jorgensen. 1985. Diagnostic Considerations in Deaf Patients. *Comprehensive Psychiatry* 26:513–21.
- Morice, R., and J. Ingram. 1983. Language Complexity and Age of Onset of Schizophrenia. *Psychiatry Research* 9:233–42.
- Morice, R., and D. McNicol. 1985. The Comprehension and Production of Complex Syntax in Schizophrenia. *Cortex* 21:567–80.
- Noël-Jorand, M., M. Reinert, S. Giudicelli, and D. Dassa. 1997. A New Approach to Discourse Analysis in Psychiatry, Applied to a Schizophrenic Patient's Speech. *Schizophrenia Research* 25:183–98.
- Oltmanns, T., R. Murphy, H. Berenbaum, and S. Dunlop. 1985. Rating Verbal Communication Impairment in Schizophrenia and Affective Disorders. *Schizophrenia Bulletin* 11:292–99.
- Poizner, H., E. Klima, and U. Bellugi. 1987. *What the Hands Reveal about the Brain*. Cambridge, Mass.: MIT Press.
- Püschel, J., H. Stassen, G. Bomben, C. Scharfetter, and D. Hell. 1998. Speaking Behavior and Speech Sound Characteristics in Acute Schizophrenia. *Journal of Psychiatric Research* 32:89–97.
- Ragin, A., M. Pogue-Geile, and T. Oltmanns. 1989. Poverty of Speech in Schizophrenia and Depression during In-Patient and Post-Hospital Periods. *British Journal of Psychiatry* 154:52–57.
- Remvig, J. 1969. Three Clinical Studies of Deaf-Mutism and Psychiatry. *Acta Psychiatrica Scandinavica, Supplementum* 210:1–120.
- Rochester, S. 1973. The Significance of Pauses in Spontaneous Speech. *Journal of Psycholinguistic Research* 2:51–81.
- Rochester, S., J. Harris, and M. Seeman. 1973. Sentence Processing in Schizophrenic Listeners. *Journal of Abnormal Psychology* 3:350–56.
- Rochester, S., and J. Martin. 1979. *Crazy Talk: A Study of the Discourse of Schizophrenic Speakers*. New York: Plenum Press.

- Romme, M., and A. Escher. 1989. Hearing Voices. *Schizophrenia Bulletin* 15:209–16.
- Rund, B. 1986. Verbal Hallucinations and Information Processing. *The Behavioral and Brain Sciences* 9:531–32.
- Salzinger, K., S. Portnoy, and R. Feldman. 1964. Verbal Behavior of Schizophrenic and Normal Subjects. *Annals of the New York Academy of Sciences* 105:845–60.
- Sanders, L., J. Adams, H. Tager-Flusberg, M. Shenton, and M. Coleman. 1995. A Comparison of Clinical and Linguistic Indices of Deviance in the Verbal Discourse of Schizophrenics. *Applied Psycholinguistics* 16:325–38.
- Schein, J., and M. Delk Jr. 1974. *The Deaf Population of the United States*. Silver Spring, Md.: National Association of the Deaf.
- Schonauer, K., D. Achtergarde, U. Gotthardt, and H. Folkerts. 1998. Hallucinatory Modalities in Prelingually Deaf Schizophrenic Patients: A Retrospective Analysis of 67 Cases. *Acta Psychiatrica Scandinavica* 98:377–83.
- Schonauer, K., D. Achtergarde, T. Suslow, and N. Michael. 1999. Comorbidity of Schizophrenia and Prelingual Deafness: Its Impact on Social Network Structures. *Social Psychiatry and Psychiatric Epidemiology* 34:526–32.
- Stearns, H. 1886. Auditory Hallucinations in a Deaf Mute. *Alienist and Neurologist* 7:318–19.
- Stokoe, W. 1960. *Sign Language Structure: An Outline of the Visual Communication Systems of the American Deaf*. Studies in Linguistics, Occasional Papers 8. Buffalo: University of Buffalo, Department of Anthropology and Linguistics.
- Thacker, A. 1994. Formal Communication Disorder: Sign Language in Deaf People with Schizophrenia. *British Journal of Psychiatry* 165:818–23.
- Thomas, H., and F. Huff. 1990. Linguistics of Schizophrenia. *British Journal of Psychiatry* 157:621–22.
- Winner, E., and H. Gardner. 1977. The Comprehension of Metaphor in Brain-Damaged Patients. *Brain* 100:717–29.
- Wykes, T., and J. Leff. 1982. Disordered Speech: Differences between Manics and Schizophrenics. *Brain and Language* 15:117–24.