Principles of Human Communication

It is obvious that communication is a conditio sine quo non of human life and social order. It is equally obvious that from the beginning of his (her) existence a human being is involved in the complex process of acquiring the rules of communication, with only minimal awareness of what this body of rules, this calculus of communication, consists of.
—Paul Watzlawick, Janet H. Beavin, and Don D. Jackson

CHAPTER OBJECTIVES

- Identify and describe the sensory modalities.
- Describe the process of sensory awareness and sensory receptivity.
- Describe how the sensory modalities transmit messages to the brain.
- Describe ways in which perceptions affect the emotional experience of individuals.
- Describe how learning is a stimulus-processing activity.
- Discuss the function or utility value of interpersonal communication.
- Discuss ways in which communication is an outcome of interpersonal processes.
- Discuss the principle of the multidimensionality of communication (i.e., the levels of communication).
- Describe how human communication is inevitable.
- Identify how punctuation functions in the delivery of interpersonal messages.
- Discuss how interpersonal communication may be either symmetrical or complementary.

Human communication is the product of a combination of numerous physiological, psychological, and environmental influences. Patterns of communication are indeed difficult to understand without knowing the origins and intricacies of communication in their relationship to neurological functioning—particularly the workings of the central nervous system but also the dynamics of communication in the interpersonal context.

Several principles and concepts of human communication increase our knowledge of this high-level capability. From the standpoint of biophysiology, these include how sensory reception of information occurs, the basis for distortions of sensory experience, the processing function of the brain, and sensory and feedback mechanisms and learning. Axioms of human communication that address the origins of communication in interpersonal interactions are also discussed.

SENSORY AWARENESS AND SENSORY RECEPTIVITY

The Sensory Modalities

Recognition that sensory awareness and sensory processing is critical to understanding human communication leads us to consider basic concepts and

principles about sensory modalities. While all senses play a role, the most salient sensory modalities to complete our understanding of human communication are the visual, auditory, and kinesthetic. Some individuals are particularly adept with the use of one modality (i.e., are better at picking up visual rather than auditory clues); others are multimodal, exhibiting strength in more than one modality. We are not exactly the same, and our capacities are capable of changing over time and in the context of our experience.

Studies of the relative strength of one modality over another suggest that age and maturation influence whether individuals are strong in only one modality or have mixed modality strength (Gazda, Childers, & Walters, 1982). The debate continues, with some researchers declaring adults to be primarily visually oriented versus their being multimodal. So while age might make a difference in our sensory strengths, it might be the same for all people.

Early on, Goldman (1967) conducted a well-designed experimental study comparing individual preferences for a sensory modality: visual, auditory, or haptic (defined as a combination of kinesthesis, pressure, and tactile sensation). He concluded that adults, as well as first- and third-grade children, preferred an auditory modality; the adults chose the visual over the haptic; the children were equally divided between the visual and the haptic.

Along these lines, another theory is that there is a sequence to the development of modality strength. Children have shown a developmental sequence of modality strengths (Barbe & Milone, 1980). In the early grades, children have more well-defined strengths and tend to be auditory rather than visual or kinesthetic. As they progress through elementary school, their modalities become mixed and interdependent, shifting toward the visual and kinesthetic. By adulthood, many people have mixed-modality strength. Other researchers, however, contend that vision is the dominant modality of the species (MacLean, 1973).

Of course, in the process of communication, all modalities work together to influence self-expression and understanding of the environment. A clear delineation of the strength or weaknesses within a given person may be difficult to establish. Still, researchers, particularly educators, are interested in the issue of modality variability and dominant modality in hopes of being able to predict and engage patterns of communication and patterns of problem solving when teaching different age groups.

Perhaps one of the most misunderstood aspects of sensory awareness is the assumption that the purpose of our sensory apparatus is to give us complete information about all the stimuli in our environment. In truth, our sensory capabilities are not designed to give us information in this way; the major purpose is to give us a very select range of feedback that is most useful to us. From studies of nonhumans (e.g., bees and other insects as well as bats), we know that some sights and sounds that are perceived by other species are not available to us. And, like many animal species, humans tend to be sensitive to only a certain range of stimuli—the stimuli most useful to their way of life. What distinguishes humans from other species is that humans can generally access a wider range of stimuli and this stimuli is unique to our way of life.

Even humans, however, have been shown to have selective perceptual abilities despite the fact they may have a broader range. For example, we can taste the sweetness in certain foods and the bitter taste of some poisons (at low con-

centrations), but we fail to be able to discern other tastes that are neither harmful nor helpful. Our sense of smell is highly attuned to many gases but insensitive to others such as nitrogen. In short, our capacity to perceive through our senses is biologically regulated, and these capacities are largely determined by the information that would be most helpful to us.

This principle of utility also applies to how and why we become selective throughout our lives. Utility for certain information changes as we grow. Consider for a minute the infant's capacity to perceive separation from a nurturing figure. While other stimuli are not meaningful, distance or nearness of the nurturing figure is critical to the infant. Our training and occupations can also influence our perceptual range. Law-enforcement professionals are keenly aware of and even exceedingly perceptive about certain environmental threats. These capacities are not inherent in others; however, repeated exposures to life-threatening conditions reinforce the need to accurately and quickly perceive environmental clues that may suggest danger. Our keen awareness of a patient about to experience a life-threatening change is a function of our exposure to these situations and why we become more acutely aware of the cues with experience.

Another important example of selective perception among groups of humans is that of pain. We know that the sensation of pain has strong motivational properties. In general, pain is to be avoided. Still, the perceived intensity and quality of pain varies a great deal. We know that pain stimuli can be the same, yet they affect people differently. We also know from observations of athletes that serious injuries may be experienced with little pain. There are still other people who report extreme levels of pain when the injury or illness does not seem to justify it. Does this also mean that some patients will require more medication than others with the same pain stimulus? This question is answered by the fact people experience pain differently but also that the same pain stimuli will be perceived differently by the same person, depending on time and context, even when the stimulus for pain has not changed at all. We also know that healthcare professionals can manipulate patients' experiences of pain by changing patients' perceptions of the stimuli. When dentists say to a patient, "You're doing fine—just a little more (drilling)," they are manipulating the patient's perception of the character of the stimuli. If a provider suggests that a pain experience is "a tug," "a needle prick," or a dull sensation, the character of the sensation of pain might change. Additionally, the suggestion that pain will subside and the patient will experience relief affects the patient's perception of whether the pain stimulus is overwhelming or within his or her control. Understanding that the pain is not out of control enables the patient to relax. Relaxation reduces the negative experience of the pain. Fear is a mediating condition that, when eased through relaxation or reassurance, will influence the experience of the sensation of pain. Most providers understand their role in helping patients manage discomfort and pain and will use the power of suggestion in helping their patients cope with pain stimuli.

Patients are thought to be able to alter, at least in part, their experience by altering their perceptions. In the arena of cognitive psychotherapy, examples of reframing one's interpretations of situations has relevance here. One can perceive his or her life or relationships as "hopeless." Feelings of hopelessness generally increase anxiety and depression related to the observation and

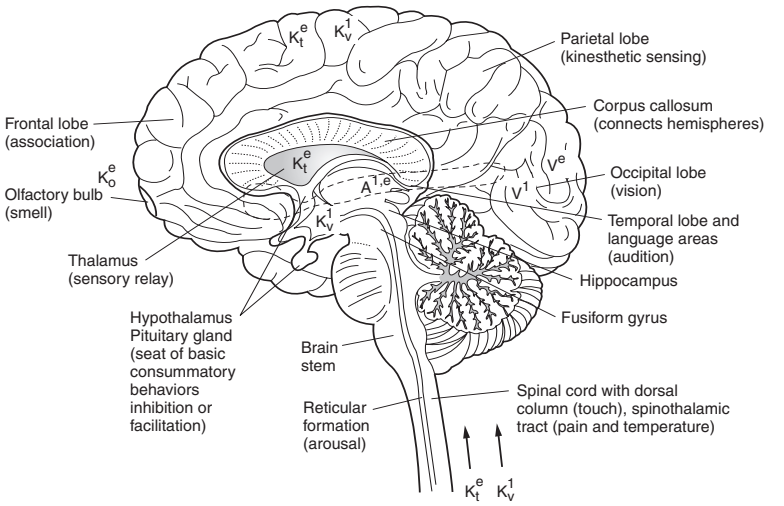
interpretation of his or her situation. However, if the perception of one's life situation is changed (e.g., a challenge is not hopeless), negative feelings of depression and anxiety seem to lessen, and the patient is able to adopt a more positive approach to problem solving. The idea is that if we can modify cognitions, assumptions, and beliefs, we can change our emotions and behaviors accordingly. Critical to a full analysis of the role of perception is knowledge of how stimulus awareness is processed in the brain.

PROCESSING STIMULI AND THE BRAIN

Through the Sensory Modalities to the Brain

When physical energy such as light, sound, heat, or cold reaches the sense organs, it must be converted to a form that can be processed in the brain. The information processing that goes on within the brain has three distinct steps.

The first step is simply *reception*: the absorption of physical energy. *Transduction* is the second step and refers to the conversion of physical energy to an electrochemical pattern in the neurons. Finally, *coding* takes place (Figure 2–1).



This medial aspect of the brain and spinal cord of the central nervous system includes a surface view of the temporal lobe, with language areas illustrated in dotted lines. Projection sites for receiving information through the sensory modalities are plotted with the following abbreviations:

$A^{1,e}$ = auditory input, both internal and external.

V^e = visual input in the occipital lobe, external.

V^1 = visualization in the deeper striate layers of the occipital lobe or temporal lobe.

K_o^e = kinesthetic input from sense of smell, external.

K_t^e = kinesthetic input from touch, external. The nerve signals move up the spinal cord in the dorsal column, are relayed through the thalamus, and are projected to the sensory cortex of the parietal lobe.

K_v^1 = kinesthetic input from pain and temperature, internal, visceral. The nerve signals move up the spinal cord in the spinothalamic tract, are processed in the hypothalamus, and are projected to the sensory cortex of the parietal lobe.

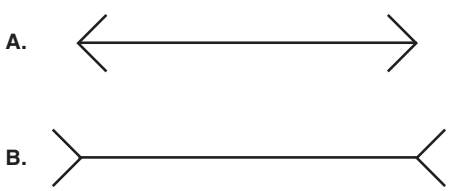
Figure 2–1 Medial View of Brain and Spinal Cord. *Source:* Reprinted from G. M. Gazda, W. C. Childers, and R. P. Walters, *Interpersonal Communication—A Handbook for Health Professionals*, p. 30, © 1982, Aspen Publishers, Inc.

Coding is the one-to-one correspondence between some part of the physical stimulus and some aspect of the nervous system. For example, light rays that strike retinal receptors (reception) are converted due to a change in the receptors' membrane polarization (transduction). The resulting train of impulses in the optic nerve has a frequency that increases as the intensity of light increases. This is evidence of coding. It should be remembered that sensory information is coded so that the brain can process it, and, interestingly enough, it may have little resemblance to the original stimuli. The idea that what is perceived is not exactly what actually is, is an extremely important principle of human communication. The proverb: "Believe half of what you see and nothing of what you hear" has some basis when we consider the fact that we always perceive selectively.

It is possible, for example, to create optical illusions. Optical illusions exist because what is perceived is actually different from what is actually there. One very common example of an optical illusion is provided in Figure 2–2. If we look at one line with one eye and the other line with the other eye, the illusion is apparent. This optical illusion, the Müller-Lyer illusion, suggests that one line may be longer than the other; usually line B is reported to be longer than line A. In fact, these lines are of the same length. Various theories used to explain optical illusions generally agree that what causes optical illusions is within the brain, not within the sensory organ (eye). To experiment with your own response to optical illusions, online examples are available through the Web (search for keywords Illusions and Paradoxes: Seeing Is Believing).

The important principle to understand is that our perceptions are not the same thing as the stimuli that are picked up by our sensory receptors. An important line of study is the appearance of hallucinations in individuals experiencing mental illness (e.g., schizophrenia). Hallucinations are involuntary and can occur in the absence of any external stimuli. Thus, a person sees or hears something that is not there. How is this possible? Silbersweig and Stern (1998) explored these questions in human auditory neuroimaging studies. They were able to gather information about normal and abnormal conscious and unconscious brain states. Their work was important in understanding how the brain can literally create its own reality . . . it can be conscious of something that is not even there. This raises the issue of whether and how the brain responds to internal stimuli versus external stimulus.

When sensory information reaches the brain, higher and more complex processing takes place. The human brain is complex, consisting of as many as



Müller-Lyer Illusions
Which Horizontal Line Segment is Longer: A or B?

Figure 2–2 Optical Illusions Perceptions Are Not Direct Reflections of Stimuli.

100 billion neurons varying in size from 4 microns (0.004 mm) to 100 microns (0.1 mm) in diameter. Neurons are cells that send and receive electrochemical signals to and from the brain and nervous system.

These neurons are not haphazardly arranged; they are assembled in discrete areas of the brain, and these areas have their own specialized function. Still, we have the experience of unity. Thus, although our brains are divided into many parts, each containing many neurons, our consciousness is as one. The unity of consciousness comes from the many connections between various brain parts.

The brain performs its information processing primarily in two domains. It is concerned with (1) language-related elements or the theoretical symbols and (2) thought-related elements or the qualitative symbols (Mullally, 1977). Processing different types of symbols is dependent on functions that occur within the left and right hemispheres of the brain.

The theoretical symbols—such as visual-linguistic elements, or the written word; auditory-linguistic elements, or the spoken word; visual-quantitative elements, or written numbers; and auditory-quantitative elements, or spoken numbers—are processed primarily in the left hemisphere of the brain. Qualitative symbols of a sensory nature, such as sounds, taste, or visual pictures, are associated with cultural codes or the meanings that are received from observing nonverbal expressions. These symbols are processed primarily in the right side of the brain.

The bilateral symmetry of the brain provides that sights and sounds, which bring information in from the external environment, are processed by using both hemispheres together. The two hemispheres are connected by the corpus callosum for the transfer of information of different sensory modalities (Brodal, 1981). In the normal brain, it appears that any information reaching one hemisphere is communicated regularly to the other, largely to corresponding regions.

Until the early 1950s, the function of the corpus callosum was not known. In the past it was, on occasion, cut by a neurosurgeon (e.g., to treat epilepsy or to reach a deep tumor in the pituitary gland). Scientists and researchers have reported anatomical, physiological, and behavioral discoveries about the specialization of the cerebral hemispheres. Bakan (1971) discusses the directions of conjugate lateral eye movement (CLEM) and the inherent duality of human behavior and experience. The neurological pathways that come from the left side of both eyes (the left visual field) are represented in the right cerebral hemisphere and vice versa. Thus, when parts of the left cerebral hemisphere are stimulated, the eyes move to the right; when parts of the right hemisphere are stimulated, the eyes shift to the left.

Day (1964) identified right-movers and left-movers—persons who tend to look to the right or left while reflecting. Right movement presumably activates the left cerebral hemisphere and its specialized functions that are verbal, analytic, digital, and objective. Left movement is presumed to activate the right cerebral hemisphere with its special functions that are preverbal, synthetic, analogic, and subjective. Individuals tend to look up and away when a question has been posed and the answer must be retrieved (Gur, 1975).

Singer (1976) reported experimental research findings to support the conclusion that if an individual is involved primarily in attending to visual

images and fantasies, the person is less likely to be accurate in detecting external visual cues. Similarly, if internal processing is primarily oriented around auditory fantasies (i.e., imagined conversations or music), then the person is less likely to be accurate in detecting external auditory signals.

In both cases, the individual is better at detecting external cues in the modality other than the one in which the person is attending to internal images and fantasies. Such experiments suggest that a private internal image or fantasy in a given modality uses the same brain structures or pathways as does the processing of an external stimulus in that same modality.

Individuals look to the side or down to eliminate visual stimuli, especially the meaningful and reinforcing face of another person that might interfere with a train of thought. Dilts and colleagues (1979), in their book *Neurolinguistic Programming*, illustrate the eye positions for visual, auditory, and kinesthetic accessing of information. They also identify each eye position with its particular body posture, breathing pattern, and hemispheric specialization (see Figure 2–3).

The right movements of the eyes access the left hemisphere for constructed images (V_c), for visualization of novel and abstract patterns, or for constructed auditory (A_c), putting an idea into words. The eyes looking down and to the right access an awareness of body sensations (K_{vto}) and kinesthetic information, including the visceral, tactile, and olfactory. The left movements of the eyes access the right hemisphere for remembered images (V_r), for visualization of eidetic patterns from past experiences, or for remembered auditory experiences (A_r) and sounds and tape loops of messages from past activities. The eyes looking down and to the left are representative of an internal auditory dialogue (A_{id}), talking to oneself, probably in short cryptic commands and suggestions and simple sentence messages (see Figure 2–3).

The left cerebral hemisphere is associated with the development of speech and language. The temporal lobe is larger on the left side than on the right in about two-thirds of the brains examined (Geschwind & Levitsky, 1968; Witelson & Pallie, 1973). The left side is best developed in the brain of the fetus and newborn infants, suggesting that asymmetry does not result from environmental or developmental factors after birth.

Electrophysiological experiments using auditory (click) and visual (flash) stimuli were designed to measure the evoked responses in the brains of both

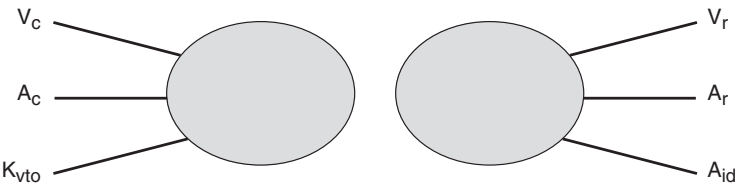


Figure 2–3 Eye Positions for Accessing Information. Visual accessing cues for a normally organized right-handed person: V_c = visual constructed; A_c = auditory constructed; K_{vto} = kinesthetic visceral, tactile, or olfactory; V_r = visual remembered; A_r = auditory remembered; A_{id} = auditory internal dialogue. *Source:* Adapted with permission from R. B. Dilts, J. Grinder, R. Bandler, J. DeLozier, and L. Cameron-Bandler, *Neurolinguistic Programming I,* © 1979, Meta Publications.

adults and five-week-old infants (Wada, 1977). The results show that auditory responses are significantly greater in the left hemisphere and visual in the right. It appeared that the fundamental auditory neurocircuitry needed for the growth of speech and language is biologically and asymmetrically designed for both initial acquisition and for further development.

Early research indicated that the right ear outperforms the left ear in hearing and identifying competing digits, a reflection of left-brain dominance for language (Kimura, 1961). The right ear has better access to the left hemisphere because of the crossed auditory pathways. While the right ear connects directly to the left hemisphere (language area), the left ear's route to the same area first must go to the right hemisphere and then cross over to the left side and the language area. However, a clear left-ear advantage was found for all melodies and environmental sounds (Krashen, 1977). It appeared that the left ear has direct access to the right hemisphere, and the right brain is dominant for music, chords, and nonverbal sounds.

It was evident from studies with patients who suffered brain damage to the right hemisphere that the right brain makes an important contribution to human performance, having functions complementary to those of the left hemisphere. The right side of the brain probably processes information differently from the left, relying more on visual imagery than on language. The right hemisphere of the brain specializes in perceiving and remembering faces, unfamiliar and complex shapes for which there are no ready names, and drawings of incomplete gestalts in which parts are missing. Its importance is to spatial orientation and visuospatial relationships. It is thought to provide the neurological basis for the ability to take fragmentary sensory information and convert it to a coherent organization of the outside world. Nebes (1977) referred to this as a sort of cognitive-spatial map by which individuals plan their actions.

Ordinarily, the left and right hemispheres exchange information when each hemisphere has access to the information that passed initially to the opposite hemisphere. All this occurs through the large bundle of fibers, corpus callosum, as well as several smaller bundles of fibers. What happens if the corpus callosum is injured? Clearly, any damage to the corpus callosum will result in impaired exchange of information. We know, for example, from those who have had surgery to interrupt severe epilepsy, that epileptic seizures can be limited to only one side of the body. This is a positive outcome of the disruption in information flow. When seizures are so severe that they cannot be controlled by customary antiepileptic drug treatment, surgery has been performed to cut the corpus callosum. This results in preventing seizures from crossing from one hemisphere to another. Thus, when seizures occur, they are less severe because they affect only one side of the body. Interestingly enough, these surgeries have brought unexpected positive results because the seizures not only occur with less severity, they also occur less frequently.

The marvels of coordination between right and left hemispheres are also seen in other cases where split-brain phenomena has been observed. Observations of the roles of right and left hemispheres have led to many speculations: for example, is one sphere more important or more dominant? When it was first determined that the left hemisphere controls speech, the right sphere

was viewed as subordinate. Its role was seen as one of support to the left sphere. Through further research, however, particularly with studies of patients whose corpus callosum was damaged (commonly referred to as split-brain patients), it became clear that the right hemisphere is capable of many more functions than was first thought. For example, the right hemisphere does understand simple speech, although it cannot control speech. It can also perform certain functions better than the left hemisphere, such as the control of emotional expression. It has been shown that after damage to the right hemisphere, people not only have trouble forming facial expressions that depict emotions, they also have trouble understanding others' emotions. Also, people who have suffered damage to the right hemisphere speak with less-than-normal amounts of inflection, suggesting impairment in emotion. Also, the right hemisphere seems to be specialized for complex visual and spatial tasks. For example, people who have damaged their right hemisphere have difficulty finding their way from one place to another.

Perceiving to Emoting

Does everyone have emotions, even if they appear to have none? Let's say you have been asked to care for young children, 7 to 12 years of age, who, you have been told, possess "inhuman destructive capabilities." They seem to have superhuman powers and state that they are on an important mission. They have been placed on Earth for the specific purpose of destroying the existing social structure so that a new system can be established. Their eyes are opaque; they have platinum hair, and they look alike. Although they have faces, they have no recognizable facial expressions. Do they have emotions? Are they aware of feelings?

The question is not whether they have emotional experiences similar to other humans, such as anger, happiness, or sadness. You cannot know what it feels like to be like them. Indeed, they may not have any conscious experience of feelings. You are looking for familiar behaviors that suggest that they have emotions. Emotion, for you, is defined as temporary changes in inflection or in the intensity of behavior. Thus, from your point of view, if they attack another person and increase the intensity of their behavior to do this, they are showing emotion. Movement, which shows no change in intensity, is, for you, lacking emotion. You observe that they attack people, but the intensity of their movements stays the same. This scenario may sound like a script from a science fiction movie; still, the question is relevant: how do we know whether this group of children (or any human beings, for that matter) has feelings and emotions and experience them in ways like ourselves?

Emotion has been studied as a function of autonomic arousal. The intensity of behavior is largely governed by the functions of the autonomic nervous system (ANS). The ANS has two systems: the sympathetic and parasympathetic processes. Both regulate the involuntary processes of the body. The ANS is named as such because it is thought to operate autonomously. There are many feedback loops in the body, and these continually send and receive information about individuals' experience. Wilhelm Reich perceived the reciprocal action of sympathetic and parasympathetic systems (Buhl, 2001). Essentially, these two parts of the ANS function reciprocally. The sympathetic

system controls arousal and the fight–flight mechanism, and the parasympathetic involves relaxation. The parasympathetic system comes into action after stimuli have been acted upon. It allows us to wind down while the sympathetic system governs arousal that occurred initially. Otherwise, the sympathetic nervous system prepares the body for intense vigorous response while the parasympathetic system increases digestion and other responses associated with relaxation. The most compelling reason for the arousal of the parasympathetic system is frequently the removal of a stimulus that excited the sympathetic system in the first place. The example of people fainting after intense arousal illustrates this point. When something life-threatening happens (e.g., almost getting run over by a car), the sympathetic nervous system is excited. When the threatening stimulus is removed, a rebound effect—overactivity of the parasympathetic system—occurs. Thus, some people might collapse or faint after this initial intense sympathetic nervous system response.

Reaction from the sympathetic nervous system occurs not only because of initial stimulus to the sympathetic system but also as a result of the individual's interpretation of the stimulus. Individuals' interpretations of the stimulus are critical. This is why it is difficult to predict reactions when people perceive a threat or challenge. For example, predicting stress levels by simply counting stressful life events may be highly unreliable. More accurate measures are those that factor in a valence or the perception of the stimulus. For example, changing jobs is generally regarded as stressful. Just how stressful can vary a great deal from one person to another, based on their perception of the change. They may not even regard it as a significant event. Because of this, we need individuals to tell us how they perceive the change—for example, on a continuum from +7 (being extremely positive) to −7 (being extremely negative). To have a total hysterectomy may be perceived as very traumatic and threatening to some women but not to others. Would it be an error then to approach all women having this surgery with expressions of deep sympathy for their condition? The surgery itself may not be the stressor; rather than the surgery, the confinement and separation from her children might be most worrisome. By discovering the unique distressing elements, we can respond more appropriately.

In the previous section, we alluded to the importance of being able to alter perceptions of events. The power of individual interpretations of stimuli has been described in certain cognitive approaches to counseling (e.g., Cognitive Behavioral Therapy [CBT]). Questions about the neurocognitive effects of psychological counseling have been explored. Some researchers have suggested that CBT has the potential of modifying certain dysfunctional circuitry associated with, for example, anxiety disorders. The implications are that this form of counseling can functionally "rewire" the brain. This has been illustrated in the work by Paquette and colleagues (2003) in experiments to regulate fear associated with spider phobia.

It is believed that the mammalian brain continually rewires itself, suggesting that the brain is undergoing change many times within a single day. Do we have the capacity to rewire our own brains? In the field of psychology, attribution theory suggests that when stimuli or events are perceived to be negative but also judged to be global (affect many parts of one's life), the experience can

be more emotionally painful. Recurring or enduring stimuli produce feelings of hopelessness. Conversely, when these same events or stimuli are perceived as manageable, they elicit feelings of hopefulness. We know that the way in which stimuli or events are interpreted has a great deal to do with the way in which people respond. People who engage in actions of "mind over matter" are using their abilities to master challenges by reinterpreting the meanings of the stimuli. Making the stimuli (perceptions of the stimuli) less threatening is their way of modulating stress-related reactions. Thus, any given event or stimuli may produce a great deal of sympathetic nervous system arousal, a moderate amount, or very little. It depends on the individual's interpretation of the event and the way he or she processes the perception of the stimuli.

For a long time, it was thought that it was impossible to exert direct control over stress, including heart rate and other biologic processes affected by the ANS. With the advent of science and practice of various versions of biofeedback, it has been found that people can control their responses to stress by progressively relaxing their skeletal muscles—as their muscles relax, their emotions become calmer. Voluntary control over responses like heart rate does not seem to be possible; however, indirect effects through the process of the progressive relaxation of skeletal muscles—possibly with biofeedback—do seem to reduce stress and promote calmness.

Emotions and the expression of emotions depend largely on an area of the brain called the limbic system. MacLean (1970) used this concept to refer to this area of the brain; "limbic" comes from the Latin word *limbus*, which means border. Parts or structures of the limbic system form a border around certain midline structures of the brain. The brain area most important for emotions and emotional expression, *the limbic system*, is a circuit that includes the amygdala, the hypothalamus, parts of the cerebral cortex, and several other structures.

MacLean (1973) identified this enlarged lobe as the connecting structure between the visual system and the limbic system of emotional behaviors. He suggested that the fusiform gyrus gives rise to the weepy feelings that people may experience upon witnessing an altruistic act:

> Primates, above all other animals, have developed a social sense which in man becomes conspicuous for its altruistic manifestations. As evidence that a charitable social sense is still in evolution we need only recall that the word altruism was coined as lately as 1853 by the philosopher Comte . . . and that the word empathy was introduced into our language by Lipps . . . about 1900. Altruism depends not only on feeling one's way into another person in the sense of empathy. It also involves the capacity to see with feeling into another person's situation. (p. 42)

Emotional behavior may be understood in part by studying the behaviors that are necessary for self-preservation and procreation. One list of such behaviors (modified from Denny & Ratner, 1970) is resting, eliminating, water balance, thermoregulation, feeding, aggressive-defensive behaviors, sexual behaviors, and care of the young. Animals, including humans, fulfill their basic needs in cycles that include an appetitive phase, a consuming phase, and a post-consuming phase (Denny & Ratner, 1970).

Even under the most normal circumstances there is a rise and fall in body activities (brain, digestive system, senses of taste and smell, etc.). This cyclical rise and fall is referred to as facilitation or inhibition, respectively; emotional behavior may be represented as exceptional states of facilitation or inhibition. Each of the several basic consuming behaviors has its own normal range of arousal and may also show a range of overreaction (extreme facilitation) and underreaction (extreme inhibition). The language used to describe feelings and emotions usually refers to these extremes. Examples of inhibitory words for underreaction are *depressed*, *helpless*, *lonely*, and *discouraged*; facilitory words for overreaction are *excited*, *angry*, *panicked*, and *passionate*.

The limbic system is said to consist of the structures in the brain that are essential to emotion. It has been described as a response-modulation system on a continuum of inhibition to facilitation for consuming behaviors that meet physiological needs (McCleary, 1966). The visual structures of the brain have connections to the limbic system in the prefrontal cortex and in the occipitotemporal lobe and the fusiform gyrus. There is evidence that these connections function to help individuals gain insight into the feelings of others—to see with feeling. MacLean (1962, p. 300) writes that in the complex organization of these evolving structures "we presumably have a neural ladder, a visionary ladder, for ascending from the most primitive sexual feeling to the highest level of altruistic sentiments."

MacLean (1973) also suggested that these large capacities of the brain may be incapable of being brought into full operation until the hormonal changes of adolescence occur. If this is so, it would weigh heavily against the claims of those who contend that the personality is fully developed and rigid by adolescence, if indeed not by the age of five or six.

Another condition previously believed to be related in part to damage in the limbic system is autism. Because the limbic system is in charge of emotions, lack of emotional response characteristic of these children was thought to be limbic system related. However, the exact explanations for the cause of autism are not yet known. According to the National Institute of Mental Health (NIMH) and National Institute of Neurological Disorders (NIND), autism is a developmental brain disorder characterized by three distinctive behaviors. Autistic children have difficulties with social interaction; have problems with verbal and nonverbal communication; and exhibit repetitive behaviors or narrow, obsessive interests. Scientists are not certain what causes autism, but it is likely that both genetics and environment play a role. Variations in many genes, influenced by one's environment, seem to interact during brain development to cause vulnerability.

Individuality in response processes is well studied. Each individual learns to depend on one sensory system or another as a means of perceiving and understanding the world. This dependence on particular sensory modalities is characteristic of human beings and generates patterns of experience that differ between and within individuals.

All normal humans have essentially equivalent sensory organs and structures, both anatomically and physiologically. The neurological pathways that serve the senses are presumed to be similar in all human brains. So what makes for the individuality? Despite the similar "equipment," no two individuals understand a particular occurrence in exactly the same way because of the

differences that are learned through selective attention to sensory input channels and with variations of experience with the senses (Bandler & Grinder, 1982; Bateson, 1972).

"Selective attention to sensory input" means that at any one time individuals usually attend to (are conscious of) one, or possibly two, of their sensory channels, and their attention is limited to only seven "bits" of information. Miller (1956) reported that the span of absolute judgment and the span of immediate memory impose severe limitations on the amount of information people are able to receive, process, and remember. *Relearning* is recognizing something similar to what we knew previously. Thus relearning a subject, say, a foreign language (French), that we have previously studied is easier and more rapid than learning a completely new subject. Although there are similarities between present experiences and memories, there are always differences.

Interference can occur if the mind gets confused about the similarities and differences between memories of previous experience and these new experiences. Using the example of learning unfamiliar languages, attempting to learn two new languages at the same time, alternating back and forth, will tend to confuse you in areas in which the two languages are similar. Imagine that you are trying to learn Spanish and French at the same time. You previously understood French after two years of college-level French. You would be relearning the French you knew before and learning Spanish for the first time. Would this be more confusing than only relearning French or only learning Spanish for the first time?

The study of how much information can be processed and retained is interesting. "Bits" and "chunks" of information have been measured and quantified by several researchers to ascertain how much individuals can know at any one time. Much discussion has centered around the idea that the amount, while varied, is fairly constant. The number 7 [e.g., the number of bits of information (7 ± 2)] is constant for the absolute judgment of inputs into one sensory channel. We know, however, that there may be quite a bit of variance in what is processed and retained. The ability to focus attention is thought to be important in protecting the brain from the bombardment of too much information, which results in confusion.

Learning from internal sensory representations includes how to pay attention to the feeling states of emotion, the visceral and proprioceptive cues for breathing and digestion, and the visual imageries of day and night dreams. Individuals "listening," so to speak, to their own bodies are knowing themselves through internal kinesthetic sensory information (K_i). Along these lines, people in states of meditation can pay selective attention to the responses occurring in the deeper recesses of the brain. They can monitor the rise and fall of emotional responses, particularly aggressive-defensive or sexual behaviors. They can identify "gut reactions" and catching the breath as kinesthetic-sensory responses to stimuli.

So, one reason individuals have different experiences despite similar genetic endowments of the brain and body and despite similar environments is that, characteristically, each one attends to different aspects of the self and of the environment. "It is something like a cooking class. Since each of us selects some similar and some different ingredients in similar and varying

proportions, we each end up with something different to put into the oven" (Gordon, 1978, p. 215).

Several factors affect any one individual's attention and processing of stimuli. Some of these factors have been mentioned previously, including damage, injury, or even irritation such as that caused by epileptic seizures. However, both drugs and diet can have an effect as well, and because they can decrease the synthesis or release of serotonin, they are potentially mood-altering substances. This is one reason drugs and diet are seriously considered when explanations of violent outbursts, anxiety, and the inability to experience pleasure are studied.

Learning: A Stimulus-Processing Activity

Sensory information taken into and processed by the brain may have both short- and long-term effects on our behavior. Still, are all aspects of sensory information retained? Our memories have a lot to do with our knowledge of the world and what we need to do. Memory, however, is fragile and does not always serve us in the way that we need it to. We are subject to forgetting, and our recall of information is not always as accurate as it needs to be to function properly. What we generally mean by memory is what scientists call *explicit memory*. This is our conscious, intentional awareness of previous experiences that come to our conscious awareness in our everyday living. It is possible for us to construct memory out of the interaction of previous experience and incoming current information (Schacter, 1990).

How do patients, for example, remember to follow our advice exactly as we instructed? Their memories may be faulty; thus, we provide a number of recurring stimuli to help activate more accurately what we told them. In the case of medication adherence, we provide pill boxes, refrigerator magnets, timers, pictures, and medication logs. Hopefully, these aids enhance conscious recollection of their previous experience with us during the time we gave them instructions.

Over the course of the study of the mechanism of memory and response, many theories of learning have been put forth. Perhaps one of the most well-known is found in Pavlov's theory of higher nervous activity (Chilingaryan, 2001). His classic conditioning theory emphasizes the role of reward. Underlying this theory is the notion that the learning process is successful because it increases the probability of a desired outcome. Pavlov proposed that learning consists of transferring a reflex from one stimulus to another; in this way, a stimulus that would normally elicit a response could be replaced with a new stimulus that would, in turn, elicit the same response. This theory, merely an inference, suggested that pairing a conditioned stimulus with the unconditioned stimulus caused the growth of a new or strengthened connection between a conditioned stimulus center in the brain and an unconditioned stimulus center in the brain. However, neither Pavlov nor his colleagues could actually observe this hypothesized growth of connections in the brain.

Pavlov's theory, like those of many other theorists of the time, was overly simplistic in many ways. First, it presumed that learning about stimuli was not related to those stimuli (i.e., learning about tastes is the same as learning

about temperatures). Second, the immediacy of the learning experience was viewed as important but was not examined in the context of the situation. It is known that certain learning (e.g., eating certain foods and getting sick), happens with a single instance. It does not take several trials to realize you should avoid this food. Also, learning to avoid the food that caused you to become sick can happen even if the taste of the food and illness are separated by short or long durations. In sum, learning can occur differently, depending on what is to be learned.

It is generally believed that during learning, some change must take place in the neurons in the brain. But, this change could take many forms, from the growth of a new axon, to new connections among neurons, to increased or decreased release of synaptic transmitters, and so on. And, it is generally believed that the mechanisms differ, depending on the particular learning task. That is, the mechanisms are not the same for all instances of learning.

In summary, learning is often attributed to changes made over large areas of the nervous system. No matter how much of our brains participate in the process of learning, what is always required is change at the cellular level. For learning to occur, cells (neurons) must change their properties. Studies that address single-cell changes attribute changes to biochemical changes. Impaired learning is often associated, then, with chemical deficiencies in the brain. Theories of this kind have demonstrated that certain drugs might impair or improve learning through different biochemical processes. Studies of memory, for example, suggest that certain proteins must be synthesized. Some drugs and hormones have been shown to facilitate memory, and while the specific action is not known or well understood, the biochemical transmission at synapses is the focus of attention.

As has been shown in this discussion of the neurophysiological basis for communication, several processes and structures are involved, ranging from small, molecular changes to larger regions of the brain and the entire central nervous system. These dynamics, in and of themselves, are exceedingly complex and are addressed in a great deal of depth in other discussions of brain topography and brain chemistry. The reader is encouraged to explore the fascinating world of neurophysiology and the progress that has occurred in understanding perception and learning. Neurolinguistics is a specialized science that studies how people receive information through the senses, process the information in neurons and neural pathways in the brain, and express the information in language and behaviors. Still to be described are the interpersonal and relationship principles of communications that come to us largely from the behavioral science fields.

INTERPERSONAL FOUNDATIONS FOR HUMAN COMMUNICATION

Communication has been said to be a conditio sine quo non of human life and social order (Watzlawick, Beavin, & Jackson, 1967). Communication (see Figure 2–4) occurs on three levels—intrapersonal (or that which goes on within an individual), interpersonal (referring to that between individuals or within groups), and mass communication (that which is transmitted publicly).

It is also clear that from the beginning of our existence, we are not only refining our neurophysiological capacities to communicate, we are equally

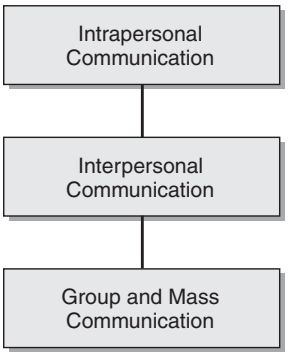


Figure 2–4 Human Communication Contexts—Within, Between, and Across People.

engaged in the process of acquiring the social rules of communication. Historically, much of what we know from science comes from the study of communication as a one-way phenomena. Knowledge of communication was largely gleaned from studies of speaker-to-listener communication; communication as a function of the process of interaction was virtually ignored. Now we operate with a much higher level of understanding about communication. We no longer think of communication singularly, as a single communicational unit or message. We think of communication as a series of messages (interaction) and as patterns of interaction (transactions). The principles and concepts presented in this discussion will address aspects of communication that are interpersonal and interactive.

Human communication is of two types: digital and analogic (Gazda et al., 1982). When we refer to something by name, we are employing *digital communication*. The same object can also be described as a representation or likeness; this represents *analogic communication*. The following example may help us differentiate these two types. When we are visiting a foreign country and we listen to people speak, we may not understand any of the language. However, if we watch the people while they are speaking—for example, their intentional movements—we may understand at least some of what the communication is about. This latter form of communication, which often includes the nonverbal content and the context of the interaction, is analogic communication. Humans are the only species known to use both digital and analogic communication. Although we rely heavily on digital communication, there are times in which we rely almost exclusively on analogic communication. With messages that we perceive and send to define relationships, we predominantly use analogic communication. Some say that emotionally disturbed children and animals are keenly aware of analogic communication. The special intuition that these groups are believed to possess makes it very difficult to deceive them. Because we use and receive both types of communication, we are constantly translating from one to another. It is like having two languages—Spanish and French—and, as sender or receiver, having to flow between them. Our abilities to translate from one mode to another is vital. To talk about our relationships, we must translate largely analogic data to the digital form (e.g., by choosing words to describe our feelings for another person). And when we

translate from the digital to the analogic, we risk the loss of information that cannot be communicated symbolically.

The Principle of Function or Utility of Communication

As in the biological sciences, the study of communication in the social sciences has led to understanding communication by the identification of its *function*. This is to say, what people perceive and express is influenced by their need to perceive and express.

Everything we learn, for example, is relative unless it has a point of reference. The point of reference may be described as human needs. We know, for example, that survival and, from an interpersonal standpoint, security are basic needs. What is generally agreed is that this principle of function holds true for virtually all perceptions and expressions. Sensory and brain chemistry suggest that only relationships and patterns of relationships can be perceived and that these form the basis of human reality. So, in one way or another, functionality is predominant in our communications; we do not just perceive an event, we scan an event looking for meaning related to our needs. In this way, objects or people are not the target of our perceptions, rather they are functions. This is an important principle because it depicts the fact that our perceptions are not random events but are organized around our perception of meaning. Thus, it is possible to say that our initial awareness, and any subsequent rectification of this awareness, is highly influenced by our awareness of ourselves and the needs we experience.

The Principle of Process

The second major concept of human communication in an interpersonal context is that of *process*. When we think about how communication occurs in relationships, we observe that no statements can accurately reflect a communicative exchange if not first analyzed from the standpoint of function and then analyzed from the standpoint of an ongoing and ever-changing process. Messages sent and received are products of a continuous process; they are not independent of other stimuli in the interpersonal environment. Communication, then, is a mutually interdependent activity among two or more individuals in a changing environmental context.

The interpersonal communication process consists of a dynamic exchange of energy among two or more individuals within a specific sociocultural context. Literally, communication is a process in which individuals share something of themselves, whether it is feelings, thoughts, opinions, ideas, values, or goals. This process, when it happens in effective interchange, helps make individuals feel more human, more in touch with reality, and more capable of social intimacy. Also, the ability of individuals to influence one another and thereby exercise power, and even control, should be considered an important impetus for interpersonal communication. The communication process has frequently been depicted in a linear fashion but has now been replaced by more complex conceptual models. Figure 2–5 illustrates this phenomena.

A concept critical to understanding communication as a process, then, is that of feedback. *Feedback* is a series of responses that depicts change. It is not a

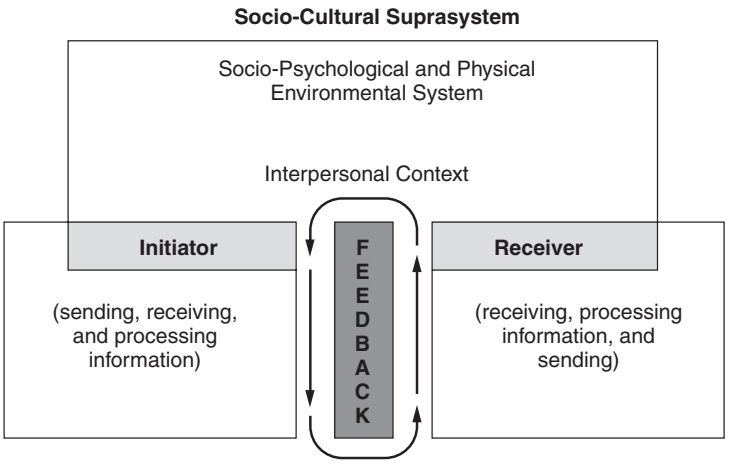
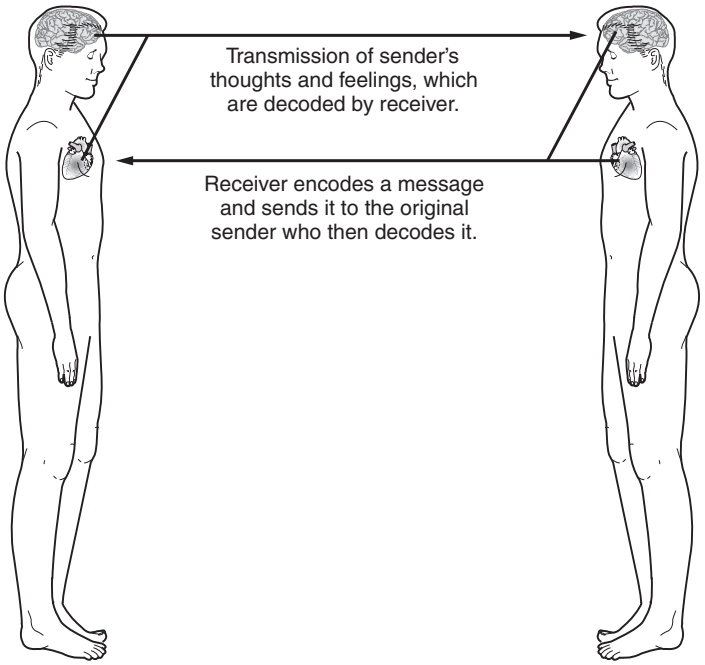


Figure 2–5 Functional Components of the Communication Process.

linear chain of events, e.g., event A affects event B, and B affects C, C, in turn, affects D, and so on. Rather, D leads back to A. Therefore, the process is circular. Feedback plays an important role in establishing, modifying, and stabilizing relationships. The concept of feedback is frequently addressed as a loop; that is, in relationships, the behavior of each person affects and is affected by the behavior of each other person. Systems that engage in feedback are distinctively different from those that do not; they generally display higher degrees of complexity. In open systems theory, open systems are generally differentiated from closed systems by the process of fluidity and permeability achieved to a great extent through the process of feedback (see Figure 2–6).

We know that some very closed systems, (e.g., cults) restrict feedback, both within the system and between the system and the larger suprasystem—society-at-large. It can be postulated that the reason that feedback is not allowed is that feedback and the exchange of information across the boundaries of the system would result in the disruption of the system. Thus, to maintain homeostasis, the cult (system) disallows open exchange with the external environment. There is no feedback. This scenario can be contrasted with the open system. Functional families, for example, display intricate levels of feedback and information processing. Family decisions may require members to voice their preferences to one another in ongoing, continuous ways. These decisions are a direct result of multiple views—not the opinions of one or two members. Decisions occur as a result not only of people voicing their views but also because these views are reactions to the views of others. Fluidity is one characteristic of these systems, and information can flow easily from member to member and between the family and its external environment. This process is transactional because individuals in an interaction affect others and are affected themselves.

When looking at theories of causality, it is appropriate to speak about the beginning statement and the results (at the end of the chain). When applying the principle of the feedback loop, this explanation is faulty: A may not cause B; the beginning is arbitrary and depends on where one enters the loop.



Sender-receiver

The sender encodes his thoughts and feelings into words and gestures and transmits them to the receiver via sound, touch, sight, and smell. At the same time, the sender is receiving messages from the person with whom he is communicating.

Receiver-sender

The receiver deciphers the sender's transmission. He determines what request the sender is making of him after he decodes the sender's cognitive and affective messages. Simultaneously the receiver is sending messages to the other person.

Feedback
Feedback refers to the circular process by which Sender and Receiver influence one another.

Figure 2–6 The Reciprocal and Circular Nature of Interpersonal Communication. *Source:* Adapted with permission from S. Smith, *Communications in Nursing,* 2nd edition, p. 5, © 1992. Mosby Yearbook.

The Principle of Multidimensionality

A third important principle of interpersonal communication is that it is *multidimensional* (see Exhibit 2–1). What does this mean and what are the dimensions? Usually when speaking of the multidimensionality of communication, we perceive two distinct levels: (1) the content dimension and (2) the relationship dimension. Watzlawick and colleagues (1967), recognizing that communication has at least two dimensions (content and relationship aspects), suggested that we cannot fully understand communication until we know something about both aspects. The relationship aspect may be more hidden, while the content aspect more transparent (Crowther, 1991). Some clinicians describe three levels: (1) the content level, (2) the feeling or emotional level, and (3) a level that describes the perceived relationship of one communicant to

Exhibit 2–1 Multidimensionality of Human Communication

- The content dimension
- The feeling or emotional dimension
- The relationship dimension

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another. This model incorporates the idea that every message has a separate emotional quality that further clarifies both the content and the relational levels of the communication. Regardless of whether we differentiate two or three levels, it is clear that communication is used not only to exchange information (e.g., facts or ideas), it is also used to address the interpersonal relationship dimension.

Consider the command: "Take this pill now with this water." The explicit message or content aspect of this expression is the obvious: you need to take the pill. However, suggested here, through both verbal and nonverbal clues, is evidence about the relationship and even what feelings one holds about the other. The command communicates authority: one person (provider) perceives herself in an authority relationship with the other (patient or client). One has power over the other, and this is enacted in the exchanges that occur. Somewhat subtle is the underlying attitude: I have expectations of you, and if you do not do as I say, you will let me down. Further, my expectations are legitimate.

Said in a somewhat different way, one aspect of a message conveys information; this is synonymous to the content of the message. It may be about anything regardless of whether it is true or false, valid or invalid, or even indecipherable. The command quality of the message, however, describes how the message should be received and, therefore, describes the relationship of the communicants. Putting these relationship aspects in words, they would say: "This is how I see myself in relationship to you, you in relationship to me or how, at least, it should be." Consider these two expressions that seemingly communicate the same directive: "Take this pill with water—it'll be easier," and "If you refuse the water, you won't be able to take this pill." While these statements communicate approximately the same content (i.e., you need to take this pill with water), they define somewhat different relationships with the patient. The first example suggests a supportive, facilitative relationship, while the latter suggests a supervisorial, somewhat skeptical relationship.

Sometimes the distinction between levels of communication are depicted in descriptions of meta-communication and meta-information. *Meta-communication* is a term frequently used to identify communication about the communication. It is communication about how a message is supposed to be received. The report aspect of the communication conveys the data; the command (meta-communication or meta-information) describes how this communication should be taken. "You better take me seriously" is one verbal translation of the meta-communication in this message: "If you think I'm going to take out the garbage, you're crazy!" The relational or meta-communicative aspects can also be expressed nonverbally; by frowning or piercing looks; or through the context of the encounter, as when people criticize each other in front of strangers.

Communication about the relational aspects, or feeling dimension, sometimes occurs at the nonverbal level.

This brings us to still another important axiom of human communication: Communication is both verbal and nonverbal (see Figure 2–7). Sometimes verbal communication is the term used to describe the content level of a message. Otherwise, what did the sender say? This is the information or direct message intended. Nonverbal aspects of communication—facial expressions, gestures, positioning—are perceived by those who receive our messages and are considered part of the communication or interaction. Nonverbal aspects frequently disclose the feeling or relational dimension of the communication as evidenced in photographs of individuals' facial expressions (see Figure 2–8).

Can you imagine being in a relationship where you cannot have access to the nonverbal content of the interaction? Facial expressions, posture, and movement would not be available data. How would you draw conclusions about the emotional and relational aspects of the interaction? You would need to rely almost exclusively on the spoken word, together with evidence of inflection, pace of speech, and tone of voice, to establish the other person's feelings about you. Would you be secure in your judgments or satisfied with your data? Most likely the answer is, not really. What is characteristic of human communication is that meta-communication (communication that classifies the relationship) is extremely important. A great deal of what is communicated through nonverbal channels is symbolic. Facial expressions or body movements are symbolic representations of the nature of the relationship between communicants. Not only do humans rely heavily on nonverbal aspects, they are trained to use these aspects to communicate more effectively and efficiently.

Discrepancies between verbal and nonverbal communication (messages) are generally picked up in human dialogue. Discrepancies can occur in many ways, for example, in different verbal reports or in differences between verbal and nonverbal messages. Consistency in communication is important because it provides a foundation for trust. Should communication be inconsistent or two opposing messages be delivered, there is reason to mistrust the other person and the relationship. In most relationships we do not look for or search for inconsistencies across verbal messages or between verbal and nonverbal messages. However, if given a reason to mistrust someone, we have the capacity to

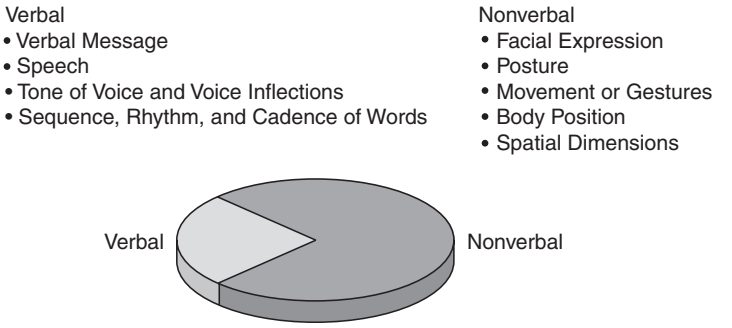

Figure 2–7 Categories of Verbal and Nonverbal Communication.

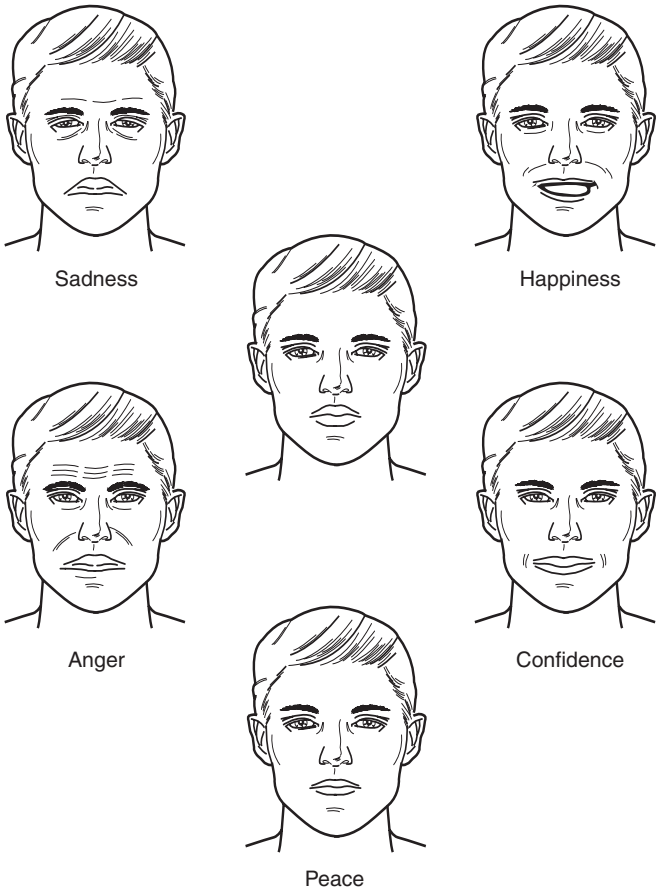

Figure 2–8 Humans Rely Heavily upon Nonverbal Aspects of Communication (e.g., Facial Expressions).

fine-tune our perceptions and be observant of mixed messages whether they are blatant or only somewhat apparent.

The Principle of Communication Inevitability

The idea that communication occurs on both verbal and nonverbal levels brings us to the next important axiom of interpersonal communication: the impossibility of not communicating, or communication inevitability. Watzlawick and colleagues (1967, p. 48) first referred to this idea as a major property of behavior. In other words, there is no such thing as nonbehavior. Putting it in simpler terms, one cannot not behave and one cannot not communicate. If we understand communication as behavior, then we can also say that no matter how much a person tries, he or she cannot not communicate. Drawing from the previous discussion of nonverbal and verbal communication, we find that words or silence, activity or inactivity, all have message potential. They influence others and, therefore, others, too, cannot not respond to these communications. To express this idea in brief: we are always communicating whether

we are exchanging words or not. The nurse who looks straight ahead and avoids eye contact when passing by a patient's family, or the physician who reads the patient's chart, moves in front of a nurse to return it, and checks his beeper without acknowledging anyone's presence are both communicating—even though no words are exchanged. The mere absence of talking does not mean communication has not occurred. In both cases, what is communicated is that the providers are busy and do not want to speak to anyone or be spoken to. Family members and staff, respectively, usually get the message and behave, in turn, by leaving them alone. Is this any less of an interchange of information than the most animated conversation?

It is also true that communication may not be intentional. Much of what is communicated is, in fact, unintentional, unplanned, and even unrealized. When we understand that messages are multileveled and include nonverbal behavior, this idea is quite plausible. Consider, for example, that a physician has a particular negative attitude about a nurse. Nothing said can substantiate this suspicion. Nonetheless, it is understood, and if people around them were asked about their relationship, they would confirm this assumption. Still, there are no data, or are there? The data is largely in the nonverbal communication that is exchanged between nurse and physician. Therefore, when we think of communication units, we do not mean simple verbal messages but rather multifaceted occurrences in which several factors are involved—verbal, tonal, postural, and even contextual aspects. Likewise, these factors have varied ways of affecting communication as well as several permutations. Permutations and variance can often be a function of cultural differences. At other times, it is a reflection of the mental or emotional stability of the sender. Some of these permutations appear in behaviors of the mentally ill or functionally impaired. A case in point is an emotionally disturbed patient who is mute and whose withdrawal and immobility express anger at those around him. Some people intentionally avoid verbal exchanges to sever commitment. A sequence of avoidance behaviors may also be interlaced with willingness to communicate. Because human relationships are complex, the explicit and implicit use of communication, which includes both verbal and nonverbal dimensions, is also very complex. Many impasses in communication relate to the complexity of relationships and the involvement of communication channels.

The Principle of Punctuation

The complexity of human relationships is also reflected in the cause-and-effect patterns that communicants claim exist. This notion is especially observed in communications in which conflict exists. The principle of *punctuation* and sequence of events, although not a major communication principle, is relevant to our understanding of the circularity of communications. When we ask two or more people to report on the patterns of their communication, we may get two very discrepant stories. Looking in from the outside, we would say that the communication we observe, from A to B to C and to D, is an uninterrupted series of exchanges. However, to those participating in the dialogue, there is a beginning, a middle, and an end. The participants see a cause-and-effect relationship and behave as though this were reality. They may punctuate their remarks at any one time in the series to depict their believed status or their desired status. These perceived beginnings, middles, and ends depict a pattern of responses

that communicates something about how one communicant sees herself in relation to another, such as on issues of power, control, and intimacy. This process of sequencing responses is inherent in all humans and is neither bad nor good. It serves the purpose of organizing behavioral events and is vital to ongoing relationships. Tendencies to organize interactions can display the specific rules of a culture. For example, if males were dominant decision makers and females predominantly followers, the interpretation of a sequence of events A–D would illustrate this cultural prerequisite. That is, we would judge, and others would confirm, that the interaction begins with A directing B to do something; it would not be concluded that B decided to do something and A simply reiterated the objective of the action after it was first initiated.

Interpretations of the inner workings of arguments further illustrate this point. With a couple who argues, who starts the argument? And, does party A withdraw because party B insults A, or is party B critical because party A withdraws? Who initiates and who reacts—party A or party B? Depending on what patterns these communicants see in their relationship, the reported sequence of events will be different. Both parties may be guilty of distorting reality, and this further complicates the situation. Finally, depending on the cultural orientations of the participants, the beginning, middle, and end may be very different from what we perceive as outside observers or even what each party thinks is occurring. It is clear then that the nature of a relationship is played out in the perceived punctuation of the segments of communication.

The Principle of Symmetrical or Complementary Communication

A final axiom of interpersonal communication that is key in understanding human communication is that communication (in relationships) is either *symmetrical* or *complementary*. People take either symmetrical or complementary roles in relationships, and this is evident in their communications (Arnold & Boggs, 1995). In the first case (symmetry), communicants tend to mirror each other's behavior. In the second instance (complementary), one party's behavior complements the other's. In the first case, differences between the respondents is minimized; both parties pull toward their common base. In the second type, maximizing differences is important. If we studied the pattern of communication among and across multiple dyadic relationships, we would come to realize that these patterns are decidedly one or the other. The classic examples of complementary communication are the parent–child, boss–employee, and leader–follower dyads. Usually these dyads participate in socially defined ways to depict superior–inferior and primary–secondary roles. Distinctively different are dyads that interact as if both parties were equal. This may be seen in colleague relationships. What is obvious is that communication that depicts these arrangements will generally hold true regardless of the contexts or circumstances. Boss–employee interactions, for example, will reflect superior–inferior status, even if the parties interact outside their professional roles.

CONCLUSION

In summary, human communication is indeed complex. The neurological, biochemical processes by which we receive information and the neural activity

by which we process the information we receive is fascinating. Our abilities to utilize communication in patterned ways to initiate, modify, and maintain relationships distinguishes us from all other species. These processes are put forward in this chapter as axioms or principles substantiated by evidence and scientific observation. In translating science to pragmatics, we run the risk of overgeneralizing or minimizing details. It is not the intention of this chapter to synthesize all scientific data. Rather, the objective is to discuss key principles from both the biologic and behavioral sciences on the subject of human communication. The chapters to follow build on the evidence accrued through time. Indeed, the evidence about the nature and mechanisms of communication continues to expand. Much of this ongoing research can be translated into clinical practice, and there is important new evidence to demonstrate its utility. An example of this is advances in the science of rejuvenating memory and improving sensory awareness among our aging and impaired populations.