similar respondent behaviors like the sunny day, he said, "Juliet is like the sun." The sun and Juliet evoked a similar effect on Romeo, controlling the metaphorical tact extension "Juliet is like the sun."

Metonymical Extension

Metonymical extensions are verbal responses to novel stimuli that share none of the relevant features of the original stimulus configuration, but some irrelevant but related feature has acquired stimulus control. Simply, one word substitutes for another in metonymical tact extensions, meaning that a part is used for a whole. As examples: Saying "car" when shown a picture of a garage, or saying "the White House requested" in place of "President Lincoln requested."

Solistic Extension

Solistic extensions occur when a stimulus property that is only indirectly related to the tact relation evokes substandard verbal behavior such as malaprops. For instance, using the solistic tact extension, a person may say "You read good" instead of "You read well." Saying "car" when referring to the driver of the car is a solistic tact extension.

Private Events

In 1945 Skinner first described radical behaviorism, his philosophy. At the core of radical behaviorism is the analysis of private stimuli (see also Skinner, 1953, 1974). Verbal behavior under the control of private stimuli has been a main topic of theoretical and philosophical analyses of behavior ever since. In 1957 Skinner stated, "A small but important part of the universe is enclosed within the skin of each individual. . . . It does not follow that . . . it is any way unlike the world outside the skin or inside another's skin" (p. 130).

A significant amount of day-to-day verbal behavior is controlled in part by private events. What is commonly referred to as thinking involves overt stimulus control and private events (e.g., covert stimulus control). The analysis of private stimulation and how it acquires stimulus control is complex because of two problems: (a) The participant can directly observe the private stimuli, but the applied behavior analyst cannot (a limiting factor in the prediction and control of behavior), and (b) private stimulus control of verbal episodes in the natural environment will likely remain private, no matter how sensitive instruments will become in detecting private stimuli and behaviors. Skinner (1957) identified four ways that caregivers teach young persons to tact their private stimulation: Public accompaniment, collateral responses, common properties, and response reduction.

Public Accompaniment

Public accompaniment occurs when an observable stimulus accompanies a private stimulus. For example, a father may observe a child bump his head on a table while chasing a ball. The public stimuli are available to the father, but not the private and more salient painful stimuli experienced by the child. The father can assume that the child is experiencing pain because of his own history of bumping objects, and may say "Ouch," or "You hurt yourself." In this way, the father is using the bump (observable stimulus) as an opportunity to develop verbal behavior under the stimulus control of a private stimulus. This may occur with an echoic to the private event; later, the stimulus control transfers to the private stimuli. Specifically, the child may echo the father's "ouch" while the painful stimuli are present, and quickly (depending on the child's history of echoic to tact transfer) the painful stimuli alone evokes the tact "ouch."

Collateral Responses

Caregivers also teach young persons to tact their private stimuli by using collateral responses (i.e., observable behavior) that reliably occur with private stimuli. For example, the father may not observe the child bump his head, but may see the child holding his head and crying. These collateral behaviors inform the father that a painful stimulus is present. The same training procedures with public accompaniment can be used with collateral responses. Because the painful private stimuli are salient, only one trial may be needed for the private stimuli to acquire stimulus control of the tact relation.

Parents should use public accompaniment and collateral responses during the beginning stages of tact training. However, even after developing a repertoire of tacting private events, a parent or listener will have difficulty confirming the actual presence of the private event as in "My stomach hurts," or "I have a headache now."

Also, learning to tact private behaviors is acquired probably with public accompaniment and collateral responses; for example, private stimuli that evoke private emotions (behaviors) that we tact with words such as *happiness, sadness, fear,* and *being upset.* Learning to tact such private events is difficult if the private stimulation is not present during training. For example, procedures that use pictures of people smiling and frowning (i.e., public stimuli) for teaching children to tact emotions will be less effective than procedures that use variables to evoke pleasure or displeasure (i.e., private stimuli) during training.

Common Properties

The two procedures described earlier use public stimuli to establish tacting of private events. Common properties also involve public stimuli, but in a different way. A speaker may learn to tact temporal, geometrical, or descriptive properties of objects and then generalize those tact relations to private stimuli. As Skinner (1957) noted, "[M]ost of the vocabulary of emotion is metaphorical in nature. When we describe internal states as 'agitated,' 'depressed,' or 'ebullient,' certain geometrical, temporal, and intensive properties have produced a metaphorical extension of responses" (p. 132). Much of our verbal behavior regarding emotional events is acquired through this type of stimulus generalization.

Response Reduction

Most speakers learn to tact features of their own bodies such as movements and positions. The kinesthetic stimuli arising from the movement and positions can acquire control over the verbal responses. When movements shrink in size (become covert), the kinesthetic stimuli may remain sufficiently similar to those resulting from the overt movements that the learner's tact occurs as an instance of stimulus generalization. For example, a child can report imagining swimming, or can report self-talk about a planned conversation with someone, or can report thinking of asking for a new toy (Michael & Sundberg, 2003). Responses produced by private covert verbal behavior can evoke other verbal behavior and will be discussed later in further detail.

Multiple Control

All verbal behavior contains multiple functional relations among antecedents, behavior, and consequences. "[A]ny sample of verbal behavior will be a function of many variables operating at the same time" (Skinner, 1957, p. 228). The functional units of mands, tacts, echoics, intraverbals, and textual relations form the foundation of a verbal behavior analysis. A working knowledge of these functional units is essential for understanding the analysis of multiple control and complex verbal behavior.

Convergent Multiple Control

Michael (2003) used the term **convergent multiple control** to identify when the occurrence of a single verbal response is a function of more than one variable. The task of an applied behavior analyst is to identify the relevant sources that control an instance of verbal behavior. For example, saying "Why did the United States enter World War II?" may be evoked by (a) MOs (making it part mand), (b) verbal discriminative stimuli (making it part echoic, intraverbal, or textual), (c) nonverbal stimuli (making it part tact), or the presence of a specific audience. For example, it's possible that an audience with contempt for war (i.e., the MO) evoked a mand, "Why did the United States enter World War II?" The question may be more a function of this variable than an intraverbal related to the ongoing conversation or the nonverbal or textual stimuli that may be present in the room. On the other hand, the speaker may have no strong MO for the answer, but asks the question because of its relation to MOs for social reinforcement related to political involvement.

Divergent Multiple Control

Multiple control also occurs when a single antecedent variable affects the strength of many responses. For example, a single word (e.g., *football*) will evoke a variety of intraverbal responses from different people, and from the same person at different times. Michael (2003) used the term **divergent multiple control** to identify this type of control. Divergent multiple control can occur also with mand and tact relations. A single MO may strengthen a variety of responses, such as food deprivation strengthening the response "I'm hungry," or "Let's go to a restaurant." A single nonverbal stimulus can also strengthen several response forms, as when a picture of a car strengthens the responses "car," "automobile," or "Ford."

Thematic and Formal Verbal Operants

Skinner (1957) identified thematic and formal verbal operants that function as sources of multiple control. The thematic verbal operants are mands, tacts, and intraverbals and involve different response topographies controlled by a common variable. For an intraverbal example, the S^D "blue" can evoke verbal responses such as "lake," "ocean," and "sky." The formal verbal operants are echoic (imitation, copying a text) and textual (and transcription) and are controlled by a common variable, with point-to-point correspondence. For example, the S^D "ring" can evoke verbal responses such as "sing," "wing," and "spring."

Multiple Audiences

The role of the audience raises the issue of multiple audiences. Different audiences may evoke different response forms. For example, two applied behavior analysts talking (i.e., a technical speaker and a technical audience) will likely use different response forms than will a behavior analyst speaking with a parent (i.e., a

technical speaker and a nontechnical audience). A *positive audience* has special effects, especially a large positive audience (e.g., as in a rally for a certain cause), as does a *negative audience.* When the two audiences are combined, the effects of the negative audience are most obvious: "[When a] seditious soapbox orator sees a policeman approaching from a distance, his behavior decreases in strength as the negative audience becomes more important" (Skinner, 1957, p. 231).

Elaborating Multiple Control

Convergent multiple control occurs in most instances of verbal behavior. An audience is always a source of stimulus control related to verbal behavior, even when a speaker serves as his own audience. In addition, it is also the case that more than one of the controlling variables related to the different verbal operants may be relevant to a specific instance of verbal behavior. Convergent control often occurs with MOs and nonverbal stimuli, resulting in a response that is part mand and part tact. For example, saying "You look great" may be partly controlled by the nonverbal stimuli in front of a speaker (a tact), but also by MOs related to wanting to leave soon or wanting to avoid potential aversive events (a mand). Skinner (1957) identified this particular blend of controlling variables as evoking **impure tacts** (i.e., impure because an MO affects the tact relation).

Verbal and nonverbal stimuli can also share control over a particular response. For example, a tendency to say "green car" may be evoked by the verbal stimulus "What color is the car?" and the nonverbal stimulus of the color green.

Multiple sources of control can be any combination of thematic or formal sources, even multiple sources from within a single verbal operant, such as multiple tacts or multiple intraverbals. Skinner pointed out that because these separate sources may be additive, the "multiple causation produces many interesting verbal effects, including those of verbal play, wit, style, the devices of poetry, formal distortions, slips, and many techniques of verbal thinking" (pp. 228–229). Additional sources of control often reveal themselves—for example, when a speaker in the presence of an obese friend who is wearing a new hat emits the "Freudian slip," "I like that fat on you." Multiple sources of control often provide the basis for verbal humor and listener enjoyment.

Autoclitic Relation

This chapter has emphasized that a speaker can, and often does, function as her own listener. The analysis of how and why a speaker becomes a listener of her own verbal behavior and then manipulates her verbal behavior with additional verbal behavior addresses the topic of the autoclitic relation. Skinner (1957) introduced the term **autoclitic** to identify when a speaker's own verbal behavior functions as an S^D or an MO for additional speaker verbal behavior. In other words, the autoclitic is verbal behavior about a speaker's own verbal behavior. The consequences for this behavior involve differential reinforcement from the ultimate listener, meaning that the listener discriminates whether to serve or not serve as a mediator of reinforcement for those verbal stimuli. A speaker becomes a listener, and observer, of his own verbal behavior and its controlling variables, and then in turn becomes a speaker again. This effect can be very rapid and typically occurs in the emission of a single sentence composed of the two levels of responses.

Primary and Secondary Verbal Operants

Michael (1991, 1992) suggested that applied behavior analysts classify verbal behavior about a speaker's own verbal behavior as *primary* (Level 1) and *secondary* (Level 2) verbal operants. In Level 1, MOs and/or S^Ds are present and affect the primary verbal operant. The speaker has something to say. In Level 2, the speaker observes the primary controlling variables of her own verbal behavior and her disposition to emit the primary verbal behavior. The speaker discriminates these controlling variables and describes them to the listener. A secondary verbal operant enables the listener's behavior as a mediator of reinforcement. For example, an MO or S^D evokes the response, "She is in Columbus, Ohio." It is important for listeners as reinforcement mediators to discriminate the primary variables controlling the speaker's behavior. The verbal operant "She is in Columbus, Ohio," does not inform the listener as to why the speaker said it. "I read in the *Columbus Dispatch* that she is in Columbus, Ohio," informs the listener of the primary controlling variable. The first level is "She is in Columbus, Ohio" (the primary verbal operant), and the second level is "I read in the *Columbus Dispatch*" (the autoclitic).

Autoclitic Tact Relations

Some autoclitics inform the listener of the type of primary verbal operant the autoclitic accompanies (Peterson, 1978). The *autoclitic tact* informs the listener of some nonverbal aspect of the primary verbal operant and is therefore controlled by nonverbal stimuli. For example, a child's statement, "I see Mommy" may contain an autoclitic tact. The primary verbal operant (i.e., the tact) is the nonverbal S^D of (a) the child's mother; (b) the response, "Mommy"; and (c) the associated reinforcement

history. The secondary verbal operant (i.e., the autoclitic tact) is the speaker's tact informing that a nonverbal S^D evoked the primary verbal operant. In this case, the nonverbal S^D was the visual stimulus of the child's mother, and the response "I see" informs the listener of the source of control that evoked the primary tact. If the child heard his mother, but did not see his mother, the autoclitic tact "I hear" would be appropriate.

The listener may challenge the existence and nature of the autoclitic tact—for example, "How do you know it's mommy?" The challenge is one way that effective autoclitic behavior is shaped and brought under appropriate stimulus control.

Autoclitic tacts also inform the listener of the strength of the primary operant. In the examples of the verbal stimuli, "I think it is Mommy" and "I know it is Mommy," "I think" informs the listener that the source of control for the primary tact "Mommy" is weak; "I know" is strong.

Autoclitic Mand Relations

Speakers use autoclitic mands frequently to help the listener present effective reinforcers (Peterson, 1978). A specific MO controls the *autoclitic mand,* and its role is to mand the listener to react in some specific way to the primary verbal operant. "I know it is Mommy" may contain an autoclitic mand. For example, if "I know" is not a tact of response strength, it may be an MO in the same sense as "Hurry up."

Autoclitic mands occur everywhere, but listeners have difficulty recognizing the MO controlling the autoclitic mand because the sources of control are private. For example, hidden agendas as autoclitic mands often revel themselves only to the careful observer. For example, a primary intraverbal such as an answer to a question about the sale of a product may contain autoclitic mands, as in "I'm sure you will be pleased with the sale," in which "I'm sure you will be pleased" is controlled by the same MO that might control the response "Don't ask me for any details about the sale."

Developing Autoclitic Relations

Speakers develop autoclitic relations in several ways. For example, a father is wrapping a gift for his child's mother, and the child nearby says, "Mommy." The father may ask the child to identify the primary variables controlling the response by asking, "Did you see her?" The father may differentially respond to "I see" indicating that clearly "Mommy" is a tact and hide the gift; rather than a mand for "Mommy," in which case, he keeps wrapping the gift. The source of control for the response "Mommy" could be the gift, as in, "That is for Mommy." "That is for" (i.e., the autoclitic) informs the father that the gift is a nonverbal stimulus controlling the primary tact, "Mommy," and the father continues wrapping the gift. As Skinner (1957) pointed out, "[A]n autoclitic affects the listener by indicating either a property of the speaker's behavior or the circumstances responsible for that property" (p. 329).

Early language learners seldom emit autoclitic responses. Skinner was clear on this point: "In the absence of any other verbal behavior whatsoever autoclitics cannot occur. . . . It is only when [the elementary] verbal operants have been established in strength that the speaker finds himself subject to the additional contingencies which establish autoclitic behavior" (p. 330). Thus, early language intervention program should not include autoclitic training.

Applications of Verbal Behavior

Skinner's analysis of verbal behavior provides a conceptual framework of language that can be quite beneficial for applied behavior analysts. Viewing language as learned behavior involving a social interaction between speakers and listeners, with the verbal operants as the basic units, changes how clinicians and researchers approach and ameliorate problems related to language. Skinner's theory of language has been successfully applied to an increasing number of human areas. For example, the analysis has been used for typical language and child development (e.g., Bijou & Baer, 1965), elementary and high school education (e.g., Johnson & Layng, 1994), college education (e.g., Chase, Johnson, & Sulzar-Azaroff, 1985), literacy (e.g., Moxley, 1990), composition (e.g., J. Vargas, 1978), memory (e.g., Palmer, 1991), second language acquisition (e.g., Shimamune & Jitsumori, 1999), clinical interventions (e.g., Layng & Andronis, 1984), behavior problems (e.g., McGill, 1999), traumatic brain injury (e.g., Sundberg, San Juan, Dawdy, & Arguelles, 1990), artificial intelligence (e.g., Stephens & Hutchison, 1992), ape language acquisition (e.g., Savage-Rumbaugh, 1984), and behavioral pharmacology (e.g., Critchfield, 1993). The most prolific application of Skinner's analysis of verbal behavior has been to language assessment and intervention programs for children with autism or other developmental disabilities. This area of application will be presented in more detail in the following sections.

Language Assessment

Most standardized language assessments designed for children with language delays seek to obtain an age equivalent score by testing a child's receptive and expressive language abilities (e.g., Peabody Picture

Vocabulary Test III [Dunn & Dunn, 1997], Comprehensive Receptive and Expressive Vocabulary Test [Hammill & Newcomer, 1997]). Although this information is helpful in many ways, the tests do not distinguish among the mand, tact, and intraverbal repertoires, and important language deficits cannot be identified. For example, these tests assess language skills under the control of discriminative stimuli (e.g., pictures, words, questions); however, a substantial percentage of verbal behavior is under the functional control of MOs. Manding is a dominating type of verbal behavior, yet rarely is this repertoire assessed in standardized testing. It is quite common to find children with autism or other developmental disabilities who are unable to mand, but have extensive tact and receptive repertoires. If a language assessment fails to identify delayed or defective language skills that are related to MO control, an appropriate intervention program may be difficult to establish. A similar problem is the failure to adequately assess the intraverbal repertoire with most standardized assessments.

If a child with language delays is referred for a language assessment, the behavior analyst should examine the current effectiveness of each verbal operant in addition to obtaining a standardized test from a speech and language pathologist. The behavior analyst would start by obtaining information about the child's mand repertoire. When known motivating operations are at strength, what behavior does the child engage in to obtain the reinforcer? When the reinforcer is provided, does the mand behavior cease? What is the frequency and complexity of the various mand units? Information regarding the quality and strength of the echoic repertoire can reveal potential problems in producing response topographies that are essential for other verbal interactions. A thorough examination of the tact repertoire will show the nature and extent of nonverbal stimulus control over verbal responses, and a systematic examination of the receptive and intraverbal repertoires will show the control by verbal stimuli. Thus, a more complete understanding of a language deficit, and hence a more effective language intervention program, can be obtained by determining the strengths and weaknesses of each of the verbal operants, as well as a number of other related skills (e.g., Partington & Sundberg, 1998; Sundberg, 1983; Sundberg & Partington, 1998).

Language Intervention

Skinner's analysis suggests that a complete verbal repertoire is composed of each of the different elementary operants, and separate speaker and listener repertoires. The individual verbal operants are then seen as the bases for building more advanced language behavior. Therefore, a language intervention program may need to firmly establish each of these repertoires before moving on to more complex verbal relations such as autoclitics or multiply controlled responses. Procedures for teaching mand, echoic, tact, and intraverbal repertoires will be presented briefly in the following sections, which will also include, some discussion of the relevant research.

Mand Training

As previously stated, mands are very important to early language learners. They allow a child to control the delivery of reinforcers when those reinforcers are most valuable. As a result, a parent or language trainer's behavior (especially vocal behavior) can be paired with the reinforcer at the right time (i.e., when the relevant MO for an item is strong). Mands also begin to establish a child's role as a speaker, rather than just a listener, thus giving the child some control of the social environment. If mands fail to develop in a typical manner, negative behaviors such as tantrums, aggression, social withdrawal, or self-injury that serve the mand function (and thereby control the social environment) commonly emerge. Therefore, a language intervention program for a nonverbal child must include procedures to teach appropriate manding. The other types of verbal behavior should not be neglected, but the mand allows a child to get what he wants, when he wants it.

The most complicated aspect of mand training is the fact that the response needs to be under the functional control of the relevant MO. Therefore, mand training can only occur when the relevant MO is strong, and ultimately the response should be free from additional sources of control (e.g., nonverbal stimuli). Another complication of mand training is that different response forms need to be established and brought under the control of each MO. Vocal words are of course the most common response form, but sign language, pictures, or written words can also be used.

The basic procedure for establishing mands consists of using prompting, fading, and differential reinforcement to transfer control from stimulus variables to motivative variables (Sundberg & Partington, 1998). For example, if a child demonstrates an MO for watching bubbles by reaching for the bottle of bubbles, then smiling and laughing as he watches the bubbles in the air, the timing is probably right to conduct mand training. If the child can echo the word "bubbles" or an approximation such as "ba," teaching a mand can be easy (see Table 4). The trainer should first present the bottle of bubbles (a nonverbal stimulus) along with an echoic prompt (a verbal stimulus) and differentially reinforce successive approximations to "bubble" with blowing bubbles (specific reinforcement). The next step is to fade the echoic prompt to establish the response "bubble" under

Table 4 Teaching a Mand by Transferring Stimulus Control to MO Control

Antecedent	Behavior	Consequences
Motivating operation Nonverbal stimulus Echoic prompt	"Bubbles"	Blow bubbles
Motivating operation Nonverbal stimulus	"Bubbles"	Blow bubbles
Motivating operation	"Bubbles"	Blow bubbles

the multiple control of the MO and the nonverbal stimulus (the bottle of bubbles). The final step is to fade the nonverbal stimulus to bring the response form under the sole control of the MO.

The easiest mands to teach in an early language intervention program are usually mands for items for which the MO is frequently strong for the child and satiation is slow to occur (e.g., food, toys, videos). It is always important to assess the current strength of a supposed MO by using choice procedures, observation of a child's behavior in a free operant situation (i.e., no demands), latency to contacting the reinforcer, immediate consumption, and so forth. The goal of early mand training is to establish several different mands by bringing different response forms (i.e., words) under the functional control of different MOs. It is important to note that MOs vary in strength across time, and the effects may be momentary. In addition, the response requirement placed on a child may weaken the strength of an MO, making mand training more difficult. Many additional strategies exist for teaching early mands to more difficult learners, such as augmentative communication, physical prompts, verbal prompts, and more careful fading and differential reinforcement procedures (see Sundberg & Partington, 1998).

Manding continues to be an important part of a verbal repertoire as other verbal operants are acquired. Soon after mands for edible and tangible reinforcers are acquired, a typical child learns to mand for actions (verbs), attention, removal of aversive stimuli, movement to certain locations (prepositions), certain properties of items (adjectives) and actions (adverbs), verbal information (WH-questions), and so on. These mands are often more difficult to teach to a child with language delays because the relevant MO often must be captured or contrived for training purposes (Sundberg, 1993, 2004). Fortunately, Michael's (1993) classification of the different types of MOs provides a useful guide for capturing or contriving MOs. For example, capturing a transitive conditioned motivative operation (CMO-T) in the natural environment involves capitalizing on a situation in which one stimulus increases the value of a second stimulus. A child who likes fire trucks may see a fire truck parked outside the window. This stimulus condition increases the value of a second stimulus condition, an opened door, and will evoke behavior that has resulted in doors opening in the past. A skilled trainer would be watchful for these events and would be quick to conduct a mand trial for the word "open" or "out." The work of Hart and Risley (1975) and their incidental teaching model exemplify this teaching strategy.

Transitive CMOs can also be contrived to conduct mand training (e.g., Hall & Sundberg, 1987; Sigafoos, Doss, & Reichele, 1989; Sundberg, Loeb, Hale, & Eigenheer, 2002). For example, Hall and Sundberg (1987) used a contrived CMO-T procedure with a deaf teenager with autism by presenting highly desired instant coffee without hot water. The coffee altered the value of hot water and thereby evoked behavior that had been followed by hot water in the past. During baseline this behavior consisted of tantrums. Appropriate mands (i.e., signing "hot water") were easy to teach when this CMO-T was in effect by using the transfer of control procedure described earlier. In fact, a number of mands were taught by using this procedure, and often the procedure led to the emission of untrained mands and a substantial reduction in negative behavior.

Mand training should be a significant part of any intervention program designed for children with autism or other severe language delays. Without an appropriate mand repertoire, a child cannot obtain reinforcement when MOs are strong, or have much control of the social environment. As a result, people who interact with the child may become conditioned aversive stimuli, and/or problem behaviors may be acquired that serve the mand function. These behaviors and social relationships can become hard to change until replacement mands are established. Teaching mands early in a language intervention program may help to prevent the acquisition of negative behaviors as mands. In addition, parents and

teachers are paired with successful manding and can become conditioned reinforcers. If people become more reinforcing to a child, social withdrawal, escape and avoidance, and noncompliance may be reduced.

Echoic Training

For an early language learner the ability to repeat words when asked to do so plays a major role in the development of other verbal operants (as in the bubbles example earlier). If a child can emit a word under echoic stimulus control, then transfer of stimulus control procedures can be used to bring that same response form under the control of not only MOs, but also stimuli such as objects (tacts) and questions (intraverbal). Because many children with autism and other language delays are unable to emit echoic behavior, special training procedures are required to develop the echoic repertoire.

The first goal of echoic training is to teach the child to repeat the words and phrases emitted by parents and teachers when asked to do so. Once echoic control is initially established, the goal becomes to establish a generalized repertoire in which the child can repeat novel words and combinations. But the ultimate goal with the echoic repertoire is to transfer the response form to other verbal operants. This transfer process can begin immediately and is not dependent on the acquisition of a generalized repertoire. Several procedures will be described to achieve the first goal of establishing initial echoic stimulus control.

The most common form of echoic training is direct echoic training in which a vocal stimulus is presented and successive approximations to the target response are differentially reinforced. This procedure involves a combination of prompting, fading, shaping, extinction, and reinforcement techniques. Speech therapists commonly use prompts such as pointing to the mouth, exaggerated movements, physical lip prompting, and mirrors to watch lip movement. Successive approximations to a target vocalization are reinforced, and others are ignored. The prompts are then faded, and pure echoic responses are reinforced. For many children these procedures are effective in establishing and strengthening echoic control and improving articulation. However, for some children the procedures are ineffective, and additional measures are necessary.

Placing an echoic trial within a mand frame can often be a more effective procedure for establishing echoic stimulus control. The MO is a powerful independent variable in language training and can be temporally used to establish other verbal operants (e.g., Carroll & Hesse, 1987; Drash, High, & Tudor, 1999; Sundberg, 2004; Sundberg & Partington, 1998). For echoic training, an MO and nonverbal stimulus can be added to the target echoic antecedent as a way to evoke the behavior (see Table 5). For example, if a child demonstrates a strong MO for bubbles, an echoic trial can be conducted while that MO is strong, and in the presence of the nonverbal stimulus of the bottle of bubbles. These additional sources of control can help to evoke the vocal response along with the echoic prompt "Say bubbles." The specific reinforcement of blowing bubbles is then contingent on any successive approximation to "bubbles." These additional antecedent variables must be faded out, and the reinforcement changed from the specific reinforcement to generalized conditioned reinforcement. For some learners, the transfer from MO to echoic control may occur more quickly if a picture of the object is used rather than the actual object (this reduces the MO evocative effect).

Children with a low frequency of vocal behaviors may have difficulty establishing echoic control. For these children procedures to simply increase any vocal behavior may facilitate the ultimate establishment of echoic control. One method is to directly reinforce all vocal behaviors. Taking this procedure one step further, if a child randomly emits a particular sound, the behavior analyst can reinforce this behavior and conduct an echoic trial with that sound immediately after the delivery of reinforcement. Some children will repeat what they initially emitted, and this interaction sets up some of the basic variables that may facilitate echoic control.

Table 5 Teaching Echoics by Using a Mand Frame and Transferring Control from Multiple Control to Echoic Control

Antecedent	*Behavior*	*Consequences*
Motivating operation Nonverbal prompt Echoic stimulus	"Bubbles"	Blow bubbles
Nonverbal prompt Echoic stimulus	"Bubbles"	Praise (GCR)
Echoic stimulus	"Bubbles"	Praise (GCR)

Automatic reinforcement procedures can also be used to increase the frequency of vocal behavior. By pairing a neutral stimulus with an established form of reinforcement, the neutral stimulus can become a conditioned reinforcer. For example, if just prior to blowing bubbles the trainer emits the word *bubbles,* bubbles can become a reinforcer. Research has shown that this pairing procedure can increase the rate of a child's vocal play and result in the emission of targeted sounds and words that had never occurred echoically (Miguel, Carr, & Michael, 2002; Sundberg, Michael, Partington, & Sundberg, 1996; Smith, Michael, & Sundberg, 1996; Yoon & Bennett, 2000). For example, Yoon and Bennett (2000) demonstrated that this pairing procedure was more successful than direct echoic training in producing targeted sounds. Individual children who have difficulty acquiring an echoic repertoire may benefit from this procedure or a combination of all the procedures described in this section.

Tact Training

The tact repertoire is extensive and often the primary focus of many language intervention programs. A child must learn to tact objects, actions, properties of objects and actions, prepositional relations, abstractions, private events, and so on. The goal of the teaching procedures is to bring a verbal response under nonverbal stimulus control. If a child has a strong echoic repertoire, then tact training can be quite simple. A language trainer can present a nonverbal stimulus along with an echoic prompt, differentially reinforce a correct response, and then fade the echoic prompt. However, for some children tact training is more difficult, and special procedures may be required.

A mand frame can also be used to establish tacting (Carroll & Hesse, 1987). The procedure is similar to that described for teaching an echoic response. Training begins with an MO for a desired object, the nonverbal object, and an echoic prompt (see Table 6). Using the bubbles example, the first and second steps are the same, with the goal being to free the response from motivational control by providing generalized conditioned reinforcement rather than specific reinforcement. As with echoic training, at this point in the procedure the transfer may occur more quickly if a picture of the object is used rather than the actual object. Also, with some children it may be more effective to fade the echoic prompt before the MO is faded. The third step in the procedure involves fading out the echoic prompt and bringing the response under the sole control of the nonverbal stimulus, thus a tact. Additional nonechoic verbal prompts may also be helpful, such as "What is that?," but these too are verbal prompts that are additional sources of control that need to be accounted for in the analysis of tact acquisition (Sundberg & Partington, 1998).

Methods for teaching more complex tacts can also make use of the transfer of stimulus control procedure. For example, teaching tacts of actions requires that the nonverbal stimulus of movement be present and a response such as "jump" be brought under the control of the action of jumping. Teaching tacts involving prepositions, adjectives, pronouns, adverbs, and so on, also involves the establishment of nonverbal stimulus control. However, these advanced tacts are often more complex than they appear, and frequently the type of stimulus control established in formal training may not be the same type of stimulus control that evokes similar tacts for typically developing children (Sundberg & Michael, 2001). For example, some training programs with early learners attempt to bring verbal behavior under the control of private stimuli, such as those involved in emotional states (sad, happy, afraid), pains, itches, a full bladder, hunger pangs, nausea, and so forth. Such verbal behavior is an important part of any person's repertoire, but because the controlling variables that are affecting the learner cannot be directly contacted by the teacher or parent, accurate tact relations are difficult to develop. An instructor cannot present the relevant private stimulus that is inside a

Table 6 Teaching Tacts by Using a Mand Frame and Transferring Control from Multiple Control to Nonverbal Control

Antecedent	*Behavior*	*Consequences*
Motivating operation Nonverbal prompt Echoic stimulus	"Bubbles"	Blow bubbles
Nonverbal prompt Echoic stimulus	"Bubbles"	Praise (GCR)
Nonverbal stimulus	"Bubbles"	Praise (GCR)

person's body, and therefore cannot differentially reinforce correct tact responses in the same way that correct tacts to objects and actions can be reinforced. Teaching a child to correctly say "itch" with respect to a stimulus coming from a portion of the child's arm is trained indirectly as the teacher reacts to common public accompaniments of such stimuli (observing a skin rash) and collateral responses by the learner (observing the child's scratching). However, this method is fraught with difficulties (the rash may not itch, the scratching may be imitated), and such repertoires even in typical adults are often quite imprecise.

Intraverbal Training

Many children with autism, developmental disabilities, or other language delays suffer from defective or nonexistent intraverbal repertoires, even though some can emit hundreds of mands, tacts, and receptive responses. For example, a child may (a) say "bed" when hearing "bed" spoken by another person (echoic), (b) say "bed" when he sees a bed (tact), and even (c) ask for bed when he is tired (mand), but (d) may not say "bed" when someone asks, "Where do you sleep?" or says, "You sleep in a . . . ." In cognitive terms, this type of language disorder may be described as a child's failure to process the auditory stimulus, or explained in terms of other hypothesized internal processes. However, verbal stimulus control is not the same as nonverbal stimulus control, and a response acquired as a tact for an early language learner may not automatically occur as an intraverbal without special training (e.g., Braam & Poling, 1982; Luciano, 1986; Partington & Bailey, 1993; Watkins, Pack-Teixteiria, & Howard, 1989).

In general, verbal stimulus control over verbal responding is more difficult to establish than nonverbal control. This does not mean that all intraverbals are harder than all tacts. Some intraverbal behavior is simple and easy to acquire. However, formal training on intraverbal behavior for a language-delayed child should not occur until the child has well-established mand, tact, echoic, imitation, receptive, and matching-to-sample repertoires (Sundberg & Partington, 1998). A common mistake in early intraverbal training is to attempt to teach intraverbal relations too early, or intraverbals that are too complex and out of developmental sequence such as personal information (e.g., "What is your name and phone number?"). Some of the easiest intraverbal relations are fill-in-the-blanks with songs (e.g., "The wheels on the. . .)" and other fun activities (e.g., Peek-a-). The goal of early intraverbal training is to begin to break verbal responding free from mand, echoic, and tact sources of control. That is, no new response topographies are taught; rather, known words are brought under a new type of stimulus control.

MOs can be helpful independent variables in facilitating the transfer of stimulus control, as in the Peek-a-Boo example, and the mand frame procedures described earlier for the echoic and tact. However, ultimately, a child needs to learn to emit intraverbal responses that are free from MO control. For example, if a child likes bubbles and the target intraverbal is for the verbal stimulus "You blow. . ." to evoke the verbal response "bubbles," then intraverbal training should involve the transfer of control from MOs and nonverbal stimuli to verbal stimuli (echoic prompts can also be used). The language trainer can present the verbal stimulus (e.g., "You blow . . .") when the MO is strong along with the nonverbal stimulus (e.g., a bottle of bubbles). Then, the trainer can begin providing generalized conditioned reinforcement rather than specific reinforcement, use a picture of the item rather than the actual item, and finally, fade the nonverbal prompt (see Table 7)

The intraverbal repertoire becomes increasing more valuable to a child as the verbal stimuli and related responses become more varied and complex. Common associations (e.g., "Mommy and . . ."), fill-in-the-blanks (e.g., "You bounce a . . ."), animal sounds (e.g., "A kitty goes . . ."), and eventually *what* questions (e.g., "What

Table 7 Teaching Intraverbals by Using a Mand Frame and Transferring Control from Multiple Control to a Verbal Stimulus

Antecedent	*Behavior*	*Consequences*
Motivating operation Nonverbal prompt Verbal stimulus	"Bubbles"	Blow bubbles
Nonverbal prompt Verbal stimulus	"Bubbles"	Praise (GCR)
Verbal stimulus	"Bubbles"	Praise (GCR)

do you eat?") will help to strengthen intraverbal behavior by expanding the content and variation of the verbal stimuli and the verbal responses. In addition, these procedures can help to develop verbal stimulus and response classes and more fluent intraverbal responding that is free from tact and echoic sources of stimulus control. More advanced intraverbal training can be accomplished in a variety of ways (Sundberg & Partington, 1998). For example, the verbal stimulus can have multiple components involving conditional discriminations in which one verbal stimulus alters the evocative effect of another, as in "What do you eat for breakfast?" versus "What do you eat for dinner?" Expansion prompts can also be used, such as "What else do you eat for lunch?," as well as additional WH-questions, such as "Where do you eat lunch?," and "When do you eat lunch?" As with the other verbal repertoires, typical developmental sequences can be a helpful guide to the progression of increasingly complex intraverbal behavior, as can the task analysis of the verbal operants presented in the *Assessment of Basic Learning and Language Skills: The ABLLS* (Partington & Sundberg, 1998).

Additional Aspects of Language Training

In addition to these four basic repertoires, there are several other components of a verbal behavior program and curriculum, such as receptive language training, matching-to-sample, mixing and varying trials, multiple response training, sentence construction, conversational skills, peer interaction, reading, and writing (Sundberg & Partington, 1998). Although a description of these programs is beyond the scope of this chapter, many of the procedures for teaching these skills involve the same basic elements of the transfer of stimulus control methods described here.

Summary

Verbal Behavior and Properties of Language

1. Verbal behavior is defined as behavior that is reinforced through the mediation of another person's behavior.
2. The formal properties of verbal behavior involve the topography (i.e., form, structure) of the verbal response.
3. The functional properties of verbal behavior involve the causes (i.e., antecedents and consequences) of the response.
4. Skinner's analysis of verbal behavior was met with strong opposition from the field of linguistics, and with indifference within the field of behavior analysis. However, Skinner predicted in 1978 that *Verbal Behavior* would prove to be his most important work.

Defining Verbal Behavior

5. Verbal behavior involves a social interaction between speakers and listeners, whereby speakers gain access to reinforcement and control their environment through the behavior of listeners.
6. The verbal operant is the unit of analysis of verbal behavior and is the functional relation between a type of responding and (a) motivating variables, (b) discriminative stimuli, and (c) consequences.
7. A verbal repertoire is a set of verbal operants emitted by a particular person.

Elementary Verbal Operants

8. The mand is a verbal operant in which the form of the response is under the functional control of motivating operations (MOs) and specific reinforcement.
9. The tact is a verbal operant under the functional control of nonverbal discriminative stimulus, and it produces generalized conditioned reinforcement.
10. The echoic is a verbal operant that consists of a verbal discriminative stimulus that has point-to-point correspondence and formal similarity with a verbal response.
11. Point-to-point correspondence between the stimulus and the response or response product occurs when the beginning, middle, and end of the verbal stimulus matches the beginning, middle, and end of the verbal response.
12. Formal similarity occurs when the controlling antecedent stimulus and the response or response product (a) share the same sense mode (e.g., both stimulus and response are visual, auditory, or tactile) and (b) physically resemble each other.
13. The intraverbal is a verbal operant that consists of a verbal discriminative stimulus that evokes a verbal response that does not have point-to-point correspondence.
14. The textual relation is a verbal operant that consists of a verbal discriminative stimulus that has point-to-point correspondence between the stimulus and the response product, but does not have formal similarity.
15. The transcription relation is a verbal operant that consists of a verbal discriminative stimulus that controls a written, typed, or finger-spelled response. Like the textual relation, there is point-to-point correspondence between the stimulus and the response product, but no formal similarity.

Role of the Listener

16. The listener not only mediates reinforcement, but functions as a discriminative stimulus for verbal behavior. Often, much of the behavior of a listener is covert verbal behavior.
17. An audience is a discriminative stimulus in the presence of which verbal behavior is characteristically reinforced.
18. Classifying verbal responses as mands, tacts, intraverbals, etc., can be accomplished by an analysis of the relevant controlling variables.

Analyzing Complex Verbal Behavior

19. Automatic reinforcement is a type of conditioned reinforcement in which a response product has reinforcing properties as a result of a specific conditioning history.
20. Automatic punishment is a type of conditioned punishment in which a response product has punishing properties as a result of a specific conditioning history.
21. In generic tact extension, the novel stimulus shares all of the relevant or defining features associated with the original stimulus.
22. In metaphorical tact extension, the novel stimulus shares some, but not all, of the relevant features of the original stimulus.
23. In metonymical tact extension, the novel stimulus shares none of the relevant features of the original stimulus configuration, but some irrelevant but related feature has acquired stimulus control.
24. In solistic tact extension, a stimulus property that is only indirectly related to the tact relation evokes substandard verbal behavior.
25. Private events are stimuli that arise from within someone's body.
26. Public accompaniment occurs when a publicly observable stimulus accompanies a private stimulus.
27. Collateral responses are publicly observable behaviors that reliably occur with private stimuli.
28. Common properties involve a type of generalization in which private stimuli share some of the features of public stimuli.
29. Response reduction is also a type of generalization in which kinesthetic stimuli arising from movement and positions acquire control over the verbal responses. When movements shrink in size (become covert), the kinesthetic stimuli may remain sufficiently similar to those resulting from the overt movements.

Multiple Control

30. Convergent multiple control occurs when a single verbal response is a function of more than one controlling variable.
31. Divergent multiple control occurs when a single antecedent variable affects the strength of many responses.
32. The thematic verbal operants are mand, tact, and intraverbal, and involve different response topographies controlled by a common variable.
33. The formal verbal operants are echoic (and imitation as it relates to sign language and copying a text), textual, and transcription, and involve control by a common variable with point-to-point correspondence.
34. Multiple audiences consist of two or more different audiences that may evoke different response forms.
35. Impure tacts occur when an MO shares control with a nonverbal stimulus.

Autoclitic Relation

36. The autoclitic relation involves two related but separate three-term contingencies in which some aspect of a speaker's own verbal behavior functions as an SD or an MO for additional speaker verbal behavior.
37. Primary verbal behavior involves the elementary verbal operants emitted by a speaker.
38. Secondary verbal behavior involves verbal responses controlled by some aspect of the speaker's own ongoing verbal behavior.
39. The autoclitic tact informs the listener of some nonverbal aspect of the primary verbal operant and is therefore controlled by nonverbal stimuli.
40. The autoclitic mand is controlled by an MO and enjoins the listener to react in some specific way to the primary verbal operant.

Applications of Verbal Behavior

41. The verbal operants can be used to assess a wide variety of language deficits.
42. Mand training involves bringing verbal responses under the functional control of MOs.
43. Echoic training involves bringing verbal responses under the functional control of verbal discriminative stimuli that have point-to-point correspondence and formal similarity with the response.
44. Tact training involves bringing verbal responses under the functional control of nonverbal discriminative stimuli.
45. Intraverbal training involves bringing verbal responses under the functional control of verbal discriminative stimuli that lack point-to-point correspondence with the response.