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PHONOLOGICAL DISORDERS II: A CONCEPTUAL FRAMEWORK FOR MANAGEMENT

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A conceptual framework for management of phonological disorders is proposed. The framework includes a 10-element system for describing the structure of management programs and invokes a diagnostic classification system for determining appropriate management content. Data from three serial studies of management structure describe the effectiveness, efficiency, and clinician acceptance of four modes of management: Drill, Drill Play, Structured Play and Play. Review of past, present, and future content of management programs emphasizes the central role of individual differences among persons with phonological disorders.

In companion articles (Shriberg & Kwiatkoski, 1982a, 1982b) we have proposed a diagnostic classification system for phonological disorders and a procedure for determining severity of involvement. This paper presents a conceptual framework for management of persons with developmental phonological disorders that follows from the content of both papers. The framework requires familiarity with three basic concepts of intervention and a set of terms and definitions for 10 basic structural elements of management programs.[1]

THREE BASIC CONCEPTS OF MANAGEMENT

Points of Intervention in Phonological Processing

Figure 1 presents a conception of the acquisition of phonology. The levels of phonological processing schematized by the boxes reflect generally accepted generative and neogenerative models of phonology. The child acquiring language assumedly has available as input stimuli only the adult caregivers' surface forms. From the occurrence of these forms in social contexts, the child constructs an underlying lexicon and a set of phonological rules (e.g., feature change rules, morphophonemic rules) that derive appropriate surface forms from these underlying representations. For the child with delayed phonological development, the assumption is that mechanism, cognitive-linguistic, and/or psychosocial factors are associated with a delay in the acquisition process (Shriberg & Kwiatkowski, 1982a). Specifically, the source of the "incorrect" surface forms may be traced to underlying representations that do not match caregivers' (Ingram, 1976; Macken, 1979), to different phonological rules mediating underlying representations and surface forms (Smith, 1973), to immature speech-motor components of the surface forms (Kent, 1976; Note 1), or to a complex of these sources.

As depicted in Figure 1, Points A, B, and C are possible intervention points for the child with delayed phonological development. Point A intervenes between the adult's surface forms and the child's underlying forms. That is, whatever the content or goal of intervention at Point A, it will involve external stimuli to be processed by the client, henceforth, the child. Point B, as a point of intervention, involves the obverse—child-generated stimuli are processed by an external agent, such as the clinician. Finally, Point C involves the child in both generating stimuli and in processing that output. As discussed later, clinicians program management units at each of these points in phonological processing—each point has potential for response acquisition and response transfer.

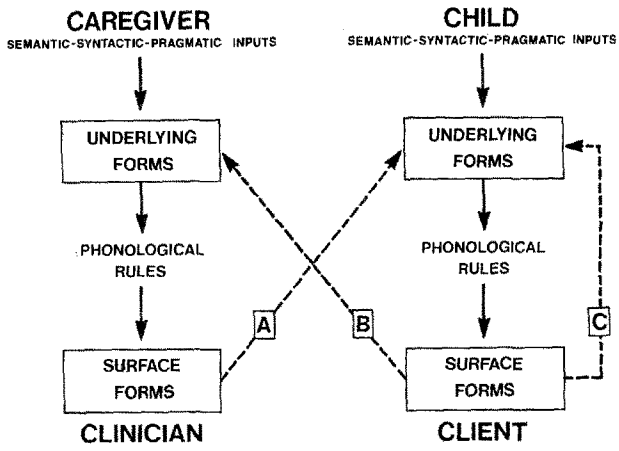

FIGURE 1. Normal acquisition of phonology and points of intervention for persons with developmental phonological disorders.

[1]Management programs may be distinguished from a management approach or a management procedure. Programs have fully specified content for each of the basic elements of management to be presented in this analytic framework. Approaches or procedures, in contrast, emphasize only selected management elements with correspondingly less specificity. In this paper, the term management program is reserved for an intervention method that contains a complete set of management elements, each of which has fully specified content.

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Comprehension Tasks Versus Production Tasks

A second of three basic concepts of management concerns the type of task depicted at Points A, B, and C in Figure 1. The interventionist may ask one or both of two tasks of the child, involving comprehension or production. Comprehension tasks consequate perception-mediated responses to target stimuli; they are oriented to goals such as awareness, identification, recognition, comparison, contrast, discrimination, monitoring, and so forth. Production tasks consequate production of a speech motor act as the target response. These two tasks are not independent of one another, because covert motor rehearsal can occur with perceptual tasks. The criterial difference is in the behavior that is consequated, that is, in the goal of the intervention task.

With reference to Points A, B, and C in Figure 1, comprehension tasks occur at Points A and C, whereas production tasks occur at Points B and C. The content of management programs for children with delayed phonological development or residual speech errors generally includes each type of task, however, programs differ in the sequencing of tasks and other factors. As will be discussed later, combination tasks often are included as a program step—such as having a child compare self-generated stimuli to both his/her long-term storage of the form (Point C) and to tape-recorded stimuli (Point A).

Type of Target Unit

A third basic concept concerns the type of target unit chosen for management. The interventionist is obliged to select from among units differing in size and theoretical status, a unit type, and member for training. In clinical parlance, this unit is what the client is to "work on." Most familiar, are units such as the feature, the phoneme, and more recently, the phonological process. Depending on the program step, the child is asked to comprehend or produce specific members of the chosen unit at one or more of the three points of intervention depicted in Figure 1.

Claims for the validity of several "basic units" of speech reflect the complex issues that define disciplines such as child phonology, experimental phonetics, motor speech control, and other areas concerned with speech processing. Note, however, that the search for the most efficient unit for intervention needs is a legitimate pursuit in its own right. For example, the syllable currently is favored among some developmentalists (Branigan, 1976) and some experimental phoneticians (Bell & Hooper, 1978). For intervention programs, discussed later, however, the phoneme and perhaps the word (Ferguson & Garnica, 1978) may be useful smaller-sized and larger-sized units, respectively. Whichever unit is chosen for training, what requires clarity are relationships between psycholinguistic levels and behavioral levels of task development.

These three basic concepts—the notion of three points of instructional entry, of comprehension versus production tasks, and of unit type—are basic to management programs for delayed phonology. In the following section, each of 10 basic structural elements of management are defined and given notational conventions. The three basic concepts and these 10 elements of management will then provide the analytic framework for a discussion and comparative review of the structure and content of management programs.

TEN BASIC STRUCTURAL ELEMENTS OF MANAGEMENT PROGRAMS

Costello (1977) and Mowrer (1977) provide excellent reviews of the structural properties of clinical management systems and notational systems for programming. For the present needs, however, we have not found any existent system completely adequate. Table 1 is a list of terms and notational conventions for 10 structural elements of management programs. Figure A includes a program format and an example of program content for each of these elements. Here, we present definitions and examples of each element.

TABLE 1. Terms and notational conventions for 10 basic structural elements of management programs.

Terms	*Notational Abbreviations*
Target Response	
1. Intended Target Response(s)	TR_{I1} ... TR_{In}
2. Response Definition(s)	RD_1 ... RD_n
3. Obtained Target Response(s)	TR_{O1} ... TR_{On}
Training Stimuli	
4. Training Stimuli (individual)	TS_1 ... TS_n
5. Training Stimuli (in blocks)	TS_{B1} ... TS_{Bn}
6. Termination Criteria	TC_1 ... TC_n
Instructional Events	
7. Antecedent Instructional Event(s)	IE_{A1} ... IE_{An}
8. Subsequent Instructional Event(s)	IE_{S1} ... IE_{Sn}
Motivational Events	
9. Antecedent Motivation Event(s)	ME_{A1} ... ME_{An}
10. Subsequent Motivational Event(s)	ME_{S1} ... ME_{Sn}
Relational Conventions	
= is at least equal to; is the same as	
≠ is not at least equal to; is not the same as	
→ leads to; evokes; receives	
⇝ does not lead to; does not evoke; does not receive	

Target Response

1. Intended Target Response (TR_I). The intended target response (TR_I) is the phonological element that has been selected for intervention. For example, the TR_I could be a particular phoneme, a cluster, or a simplification process. As before, notice that a TR_I itself is never directly observable only behaviors associated with tasks

Page____

Program Title S-Morpheme Client (s) B.W.

Clinician/Aide____ Age (s) 5-2

Other Data____

PHASE	STEP	MODE	ENTRY POINT	TR_I	TS_B	RD	IE_A	ME_A	IE_S $TR_0=RD$	IE_S $TR_0\neq RD$	ME_S TYPE	ME_S SCHEDULE	TC
I (Plural morpheme: CVCC)	2 (Word level; auditory model only)	DP	B	/s/ Plural (as plural morpheme)	TS_{B1} = 10 pictorable CVCC(plural /s/) (1)other Cs are in child's phonetic inventory (2)other Cs will not "trigger" stopping of final C	RD_1 = acoustically correct sibilance per /s/	Present picture of target word; "Listen, say TS_1..."	(See B.W. "menu" of preferred activities)	"Right you said TS"	"No, let's practice. Repeat IE_A. If TR_0=RD, "That's right. Say it like that the next time and you'll get a ME_S" (tangible) If $TR_0\neq RD$ in two trials, repeat Step 1	Tangible + Social if TR_0=RD on first try. Social only on all other trials	1:1 (social)	3x consecutive TS_{B1} at 80% RD_1 on first trial

FIGURE A. A program format for the 10-element system. A sample step from an experimental program is included to illustrate use of the abbreviatory conventions described in Table 1.

constructed at Points A, B, or C (see Figure 1) are available for consequation. This obviously is the case for comprehension responses; as depicted in Figure 1, it also is the case for production responses wherein only surface forms are available for behavioral management.

2. *Response Definition (RD).* A response definition prescribes the observable, topographic features required for levels of performance on a TR_I. RD_1 specifies the highest level of performance, with RD_2, RD_3, and so forth available as definitions for lesser performance on the TR_I. For example, RD_1 could require an /s/ with acoustically correct sibilance, whereas RD_2 might require only any fricative-like continuant sound. Another example: the child who makes a correct discrimination response in less than 2 sec could be considered to have met RD_1, whereas any correct discrimination with a latency of 2 to 4 sec could qualify as RD_2, and so forth. Contemporary RD's often require narrow phonetic transcription skills, including reliable skills in transcribing suprasegmentals.

3. *Obtained Target Response (TR_0).* The obtained target response (TR_0) is the observable behavioral response from the child. As above, the TR_0 may or may not meet the response definitions (RD_1, RD_2, . . .) specified for the TR_I. Some notational possibilities are: $TR_0 = RD_1$, $TR_0 \neq RD_1$, $TR_0 = RD_2$, and so forth. Program progress and branch adjustments depend on the clinician's ability to respond to the subtle changes in TR_0's that occur over trials.

Training Stimuli

4. *Training Stimuli.* Training stimuli are linguistic units in which the TR_I is embedded. In most cases, the TR_I is embedded in one or more training string chosen by the clinician for specific properties (e.g., phonetic, syntactic, semantic, pragmatic). Each such training stimulus (a syllable, a word, a phrase, a sentence, etc.) can be identified by a subscript, i.e., TS_1, TS_2, . . .). In some situations, TR_1 = TS for example, if a particular sound is being trained in isolation or if a particular word is being trained at the word level.

5. *Training Stimulus Block (TS_B).* When referring to training stimuli collectively, as in a list or a block of words, the notation TS_B is used. For example, performance on a block of five training stimuli might yield 80% correct; in notation, TS_B = 80%. For any given program phase or program step, more than one block of training stimuli might be used (i.e., TS_{B1}, TS_{B2}, . . .)

6. *Termination Criterion (TC).* The termination criterion (TC) is operationally linked to the performance on training stimuli. For each step in a management program, the programmer specifies a performance level (TC) that is both necessary and sufficient for advancing to the next step in the program. Termination criteria specification typically involve a performance level (RD), a percentage of achievement on the training stimulus block (e.g., TS_B = 80%) and the number of times in which the percentage correct on each trial block must be achieved either consecutively or in a given number of trials. For example, a termination criterion that requires three consecutive trial blocks at 90% correct or better at a response definition described as secondary may be symbolized as: TC_1 = 3× consecutive TS_B @ 90% RD_2. The same step could contain an alternative termination criterion: TC_2 = 3× consecutive TS_B @ 80% RD_1.

Instructional Events

7. *Antecedent Instructional Event (IE_A).* Instructional events purpose is to obtain a target response that is similar to the intended target response. Antecedent instructional events (IE_{A1}, IE_{A2}, . . .) occur before the intended target response. The Antecedent Instructional Event

may include various combinations of clinician, material, and instrumental stimuli, depending on which best evokes correct TR_0's from the child. Each stage of the program requires specification of the instructional events to which a child will have access. In general, the science of programming steps is to successively fade the number and magnitude of IE_A's needed to evoke TR_0 = RD while increasing the linguistic complexity of the TS's. In practice, a given instructional event (IE_{A1}) may evoke correct responses for one member of a set of training stimuli but not for another member in the TS_B. Symbolically, IE_{A1} (TS_1) → TR_0 = RD_1, whereas IE_{A1} (TS_2) → TR_0 = RD_1 (or IE_{A1} (TS_2) → $TR_0 \neq RD_1$).

8. Subsequent Instructional Event (IE_S). Subsequent instructional Events (IE_{S1}, IE_{S2}, . . .) include all clinician, material, and instrumental stimuli that occur after the TR_0. These events also have as their goal behavioral change relative to RD. The Antecedent Instructional Events are particularly crucial following incorrect responses, that is, $TR_0 \neq$ RD.

Motivational Events

Motivational events goal is the facilitation of behavioral change on TR_I's. The assumption is that motivational events serve two functions: they may be necessary simply to enable learning trials for certain children, and they presumably accelerate learning by heightening a child's receptivity to all instructional events.

9. Antecedent Motivational Events (ME_A). Antecedent motivational events (ME_{A1}, ME_{A2}, . . .) occur before, concurrently, or after IE_A's but always before or concurrently with the obtained target response, TR_0. As above, IE_A's either simply enable a TR_0 (that is, the child would not enter into practice trials without the motivational framework) or they have a motivational effect that accelerates learning while the child is responding, increase retention, and so forth. For example, spinning a spinner to choose a TS (i.e., TS_1 vs TS_2) in which to say a TR_I is a simple example of an ME_A. This play activity can enable lengthy training cycles—that is, ME → TS_1 → TR_{01}; ME → TS_2 → TR_{02}, and so forth. A more complex example is the motivational set of a child playing "teacher"—the child is given the opportunity to call out a block of TS's for other members of a management group to attempt to correctly imitate. The motivational "set" in this role assumedly heightens a child's receptivity to cues in both comprehension and production domains. Whether acquisition and/or retention actually are enhanced in such contexts are questions that have not been addressed in the literature.

10. Subsequent Motivational Events (ME_S). Subsequent motivational events (ME_{S1}, ME_{S2}, . . .) are roughly synonymous with the concepts of reinforcement, with the usual proviso that the behavioral consequences for reinforcing properties of ME_S's can be determined only empirically. In the usual sense, if TR_0 = RD, a child is given the opportunity to experience a particular ME_S. Symbolically, TR_0 = RD → ME_S. On programs that use graded reinforcement, a representation might be symbolized as follows: $TR_0 = RD_1 \rightarrow ME_{S1}$; $TR_0 = RD_2 \rightarrow ME_{S2}$, and so forth. Both the type of ME_S (edible, tangible, social) and its schedule of occurrence relative to correct TR_0's (continuous reinforcement, ratio schedules, and so forth) are part of the program's specifications (see the program format in the Appendix).

SUMMARY

The first two sections of this paper present three basic concepts of management and a 10-element system for describing the structural elements of a management program. The program format in Figure A illustrates how this analytic framework can be used for writing programs. Later, this framework is used for comparative analyses of the content of past, current, and future programs for children with delayed phonological development. Here, we proceed with a review of studies conducted to explore issues in the structure of management programs for such children.

THE STRUCTURE OF MANAGEMENT PROGRAMS FOR PHONOLOGICAL DISORDERS

Background and Definitions for Four Structural Modes

The importance of management structure (the form of a management program) becomes known to interventionists who attempt to work with young children. Our first experimental programs for young children with delayed speech focused on the selection and sequencing of target responses after careful linguistic analysis of a child's speech. In this concern with content, we assumed that the structure of these programs should reflect a behavioral *zeitgeist*. The goal was effectiveness and efficiency, with corresponding emphasis on intensive production drills. As we worked more with younger children, it became obvious that regardless of how appropriate the choice of target responses and training stimuli was, the structure of the management programs needed attention. For these children, the efficient stimulus-response paradigms of behaviorism were not effective. The children did not like to "drill," no matter what the payoff. Moreover, the management structures were not at all satisfying for the speech-language clinicians. Yet we were reluctant to take a step backwards to the presumably inefficient game-playing era of clinical speech-language pathology (Mowrer, 1970). Following a brief, essentially unproductive literature search, a research program in this area was initiated.

A concept of management *modes* was developed. The possible conditional arrangements of the basic elements of management described earlier (see Table 1) were operationally divided into four structural modes. The goal in conceptualizing the four structural modes was to de-

fine the scope of possible intervention structures ranging from "drill" to "play." These four management modes are schematized in Table 2; for efficiency, the abbreviatory devices defined in Table 1 are used.

TABLE 2. Four arrangements (Modes) of the 10 basic elements of management.

Mode	*Arrangement of Structural Elements*
Drill	$IE_A \rightarrow TS \rightarrow TR_0 \nearrow IE_S$; $TR_0 \searrow ME_S{}^1$
Drill Play	$IE_A \searrow TS \rightarrow TR_0 \nearrow IE_S$; $ME_A \nearrow$; $TR_0 \searrow ME_S{}^1$
Structured Play	$IE_A \searrow TS \rightarrow TR_0 \nearrow IE_S{}^2$; $ME_A \nearrow$; $TR_0 \searrow ME_S{}^3$
Play	$IE_A{}^4 \searrow$ [5] $TS \rightarrow TR_0 \rightarrow ME_S$; $ME_A \nearrow$

Conditional Occurrences of Basic Elements (dotted lines):
1. Only if $TR_0 = RD$
2. Only if child is receptive
3. Even if $TR_0 \neq RD$
4. Only as can be meaningfully incorporated into play activity
5. Only as occurs in the context of the play activity

The first mode of management is termed *Drill* (D). Drill mode is characterized by the lack of an antecedent motivational event (ME_A). The clinician or some instrumental means presents antecedent instructional events (IE_A), followed by the training stimuli (TS_1, TS_2, . . .) which contain the intended target response (TR_I). The child is rather like a pawn in this arrangement. That is, the child has no control over the selection and rate of presentation of training stimuli. In the extreme, Drill is characterized by extremely rapid rates of stimulus presentation; hence, it purportedly maximizes efficiency.

Drill Play (DP), the second mode of management, is distinguished from Drill by the inclusion of an antecedent motivational event (ME_A) before, concurrent with, or after the IE_A. To the extent to which ME_E's truly are "fun" for the child, the assumption is that this added element enables training or increases receptivity to learning (see previous definition). By definition, this element must be an event—simply reminding a child to "try" to be correct in order to achieve a subsequent motivational event (ME_S) does not qualify as an ME_A. Since an event requires varying amounts of time, the assumption is that the inclusion of an ME_A reduces efficiency.

The third management mode, Structured Play (SP), is structually similar to Drill Play. However, the training stimuli are cast more as play activities and the clinician has an option to provide subsequent instructional events (IE_S) or not, depending on the child's receptivity to such events. If a child's obtained target response (TR_0) does not meet the response definition (RD) and the clinician does not think the child will be receptive to an IE_S, the clinician may elect to resume the play-like activity without comment.

Finally, Play (P), to the child experiencing this mode, is apparently . . . play. The clinician's task is to arrange activities so that a sequence of TR_0's will occur as a natural component of the activity. Clinicians may use modeling, self-talk, and other ploys as IE_A's. In Play, both IE_A's and IE_S's occur only as they will seem natural to a child in the play context.

Table 3 provides an example of a management activity as it might occur within the four structural modes. Notice that the very same contents (TR_I, RD, TS_B) are present in each of the four modes; differences among modes are in the arrangment and conditional occurrence of some structural elements. As introduced, the notion is that these four arrangements of the basic elements of management define the range of possibilities (from "drill" to "play") available to clinicians. The following report documents findings obtained from three serial studies of four structural modes of management.

Studies of the Four Structural Modes of Management

Three questions about the use of the four structural modes of management with children with delayed speech seemed interesting to pursue: (a) How effective and efficient are each of the four modes? (b) Is any one mode more appropriate for children classified similarly on a diagnostic classification system (Shriberg & Kwiatkowski, 1982a) and (c) What are clinicians' personal observations of and preferences among the four modes?

Three studies of the four structural modes were undertaken over a 3-year period. Each was conducted in a 6-week summer program in conjunction with a university training clinic. Each involved 9-12 children, 70% boys, ranging in age from 3:10 to 9:0. All children had been referred to the summer program because of poor intelligibility. Prior to enrollment in the program, children were assessed for mechanism, cognitive-linguistic, and psycho-social functioning. Phonological description and causal-correlative indices were applied retrospectively as the diagnostic classification system described in Shriberg and Kwiatkowski (1982a), achieved its final form. It is convenient first to describe procedures for all three studies, then to present an integrated discussion of results.

Study A

The first study conducted in the summer of 1977 included 12 children, 8 boys, 4 girls (age range = 3:10 to 9:0; mean age = 5:7). These children were eventually seen for 19 management days distributed as four morning sessions per week for five weeks. Each child's morn-

TABLE 3. An example of a management activity—"Mailbox"—as it could be adapted in the four structural modes. Details are only sufficient to illustrate criterial differences among the four modes.

Mode	*Training Stimuli (TS_B)*	*Antecedent Instructional Event (IE_A)*	*Antecedent Motivational Event (ME_A)*	*Subsequent Instructional Event (IE_S)*	*Subsequent Motivational Event (ME_S)*
Drill	10 3 × 5 cards with pictures containing the TR_I in word-final position	Clinician stresses RD and reaching TC. Clinician holds up each TS for child to say; clinician uses production cues as necessary.	None	TR_0 = RD→KR* (e.g., "good," "that's right," etc.) $TR_0 \neq$ RD→RSM**	Child gets to "mail" each "card" in mailbox only if TR_0 = RD. Clinician prompts child to "hurry" if ME_S takes too long.
Drill Play	Same as above	Clinician stresses the RD and reaching TC; clinician uses production cues as necessary.	TS_B introduced as "cards to be mailed." Child selects a TS, prepares an envelope for each TS (e.g., "stamps it"). Clinician prompts child to hurry if ME_A takes too long.	Same as above	Same as above
Structured Play	Same as above	Clinican stresses fun of ME_A, ME_S; RD is secondary; no mention of TC; production cues only if child is receptive.	Same as above, but clinican prompts child to "hurry" only as meaningful for continuity of activity.	TR_0 = RD→KR** $TR_0 \neq$ RD→KR; RSM only if child is receptive.	Child always gets to mail the cards. Clinician prompts child to "hurry" ME_S's that take too long only in play context (i.e., no mention of TC).
Play	Same as above	Clinician emphasizes only the play activity; no mention of the TR_I, RD, or TC.	Same as above. More play involvement of clinician e.g., "I wonder who will receive the mail?"	No explicit KR or RSM. Clinician can model TR_I only as TS incorporated into play e.g., "I wonder if Uncle Fred will like this TS?"	Same as above; ME_A and ME_S appear to child to be the entire focus i.e., "playing mailbox."

**KR = Knowledge of results (information on performance).
*RMS is an abbreviation for the transitive sequence: Repeat—Simplify—Modify. This sequence is described later in a footnote.

ing was divided into 20-minute units in which management in three of the four structural modes (see Figure 2) was conducted in counter-balanced order by 1 of 6 student clinicians. Student clinicians were assigned to subgroups of the 12 children with each clinician-child subgroup (termed a *pod*) consisting of two clinicians and four children. Hence, each child received management from two clinicians during the program.

The six student clinicians were familiarized with definitions of the four modes of management by lectures, handouts, and discussion. They were also taught an experimental management program dubbed the *Anti-Stop Program*. Training stimuli for the program consisted of monosyllabic words containing /s/, /z/, /ʃ/, or /tʃ/ in initial and final position. Each child's block of training stimuli was carefully constructed to contain words that would not trigger other natural processes as determined from the assessment data (Shriberg & Kwiatkowski, 1980). A block of five such training stimuli for each sibilant was randomly assigned to each structural mode for each child. The program followed a conventional sequence of learning stages: IE_A's were gradually faded while TS_B's were successively increased in structural and linguistic complexity. RD's required only a "fricative-like" sound for /s/ targets; however, responses that approximated a socially accepted /s/ were given more valuable ME_S's.

Data collection procedures required that clinicians report the child's percentage of correct responses for the first and last TS_B within each 20-minute unit each day. Although graded reinforcement was used (i.e., TR_0 = RD_1 = ME_1; TR_0 = RD_2 → ME_{S2}), reported data reflect only percentage correct at RD_1, that is, "socially-acceptable" /s/ responses. Missing data occurred occasionally for each child in the course of the 6-week program.

Study B

Ten children were enrolled in the 6-week phonology clinic program in which data were obtained during the

summer of 1978 for Study B. Included were 7 boys and 3 girls (age range = 4:0 to 7:6; mean age = 5:4). All children had errors on the sibilant fricatives in addition to other errors. Six student clinicians were divided into three pods consisting of two clinicians and 3 to 4 children. Mornings were divided such that five 20-minute units were available for each child to experience each of the four modes, plus one unit for an intramode reliability assessment. Modes were counterbalanced during the week so that each child experienced each mode once per day in balanced order. Reliability sessions for each of the four modes were obtained at least once per week per child. These sessions were independent of the training in the same mode earlier each day; a different activity was used, but the program step was initiated at the same place for each session. Further, counterbalanced scheduling of clinicians insured that each clinician was the primary teacher for each of the four modes for an equivalent number of sessions each week.

Booklets that completely described an experimental phonology management program and the data collection procedures were prepared and distributed to each clinician. The phonology program used with all children was dubbed an /s/ Morpheme Program. The program goal was to teach /s/ production in a series of TS_B progressing from morpheme-final /s/ in simple monosyllables (CVC) to /s/ as a grammatical morpheme (plurals, possessives, third person singular) in clusters and in polysyllabic words. During several sessions prior to onset of the study, clinicians discussed all technical aspects of the four modes, prepared materials for each TS_B, and role-played clinician behaviors to clarify all aspects of the research program. TS's were constructed according to guidelines similar to those used in Study A. For early phases of the program, CV and CVC words ending with /s/ were used; they had to begin with consonants in the child's productive inventory and be functional words for the child. TS's at later phases of the program had to meet these criteria, as well as the structural and grammatical criteria.

Study C

A third study was conducted for a 6-week session in the summer of 1979. The study included five student clinicians and nine children, seven boys and two girls (age range = 4:1 to 8:6; mean age = 4:5). Four of these children had participated in at least one of the two previous studies. The 4-day per week program was divided into four half-hour units per morning with each of the five student clinicians responsible for both individual and group sessions with children. The phonology management program for this study varied both in structural mode and target response content. Basically, the goal of Study C was to construct highly individualized programs for each child, using all available sources of assessment information. These programs ranged from articulatory-specific motor planning programs presented in Drill mode to group intelligibility activities given in Structured Play mode.

The five student clinicians were given a week of training, including intensive practice in phonetic transcription, natural process analysis, and lecture-discussions on phonological disorders in children. Program data were kept for other research purposes as well as for the goals of this study. In the present context, we were interested in collecting clinicians' perceptions of possible differences among management modes. For these purposes, questionnaire data were obtained; the construction of these questionnaires will be described later in context.

Reliability of Clinician Behaviors and Phonological Data

For each of the three studies, the consistency of students' behaviors within programs, modes, and response definitions was monitored by daily observation by the authors, by daily and weekly individual conferences with the authors, and by weekly staff conferences. This high intensity of monitoring was the primary tactic for insuring that program elements were followed consistently and that judgments (i.e., TR_0 = RD; $TR_0 \neq$ RD) were consistent within and across clinicians and across the three studies. Essentially, clinicians were trained to agree with the authors within each study and from year to year. Data judged unreliable for any clinician, child, or program step were removed from analyses. For example, if a clinician was obviously not prepared for a given program step or if a child was obviously upset, these data were removed from analyses.

Direct assessment of the intersession stability of children's performance on the four modes and an indirect check on clinicians' agreement on target response performance is available from Study B. As described, the fifth session of each morning in Study B was for reliability assessment, with training in one of the four modes repeated. Reliability data were obtained for 7 of 10 children; the remaining three were otherwise occupied during the fifth session.

Intramode stability for each of the seven children was calculated by comparing the average percent correct on all TS_B's for each of the two modes each day. Most sessions averaged three 5-item TS_B's for each child in the 20-minute group session with a range of 1-6 TS_B's per child per mode. Overall, the average difference between the percentage correct in each of the two sessions was remarkably similar across the four modes. Average differences (in the percentage correct per TS_B) between original and reliability sessions was approximately 14% for both Drill and Structured Play, and approximately 17% for both Drill Play and Play. These figures indicate that the TR_0 data from each mode can be considered stable in more than 4 of 5 trials for each TS_B. That is, intramode stability is above 80%. Agreement figures were similar whether the reliability data were obtained by the same or by a different clinician in the pod; hence, these data also support interclinician agreement. Finally, these agreement data were plotted across time (June through August); no differences in absolute magnitude or varia-

bility about the central tendency were observed for these trends.

RESULTS

How Effective and Efficient Are Each of the Four Modes?

Data addressed to the effectiveness and efficiency of modes is available from Study A and Study B. Figure 2 illustrates the averaged program data by mode from Study A; Figure 3 illustrates the averaged program data by mode from Study B, including the results of non-

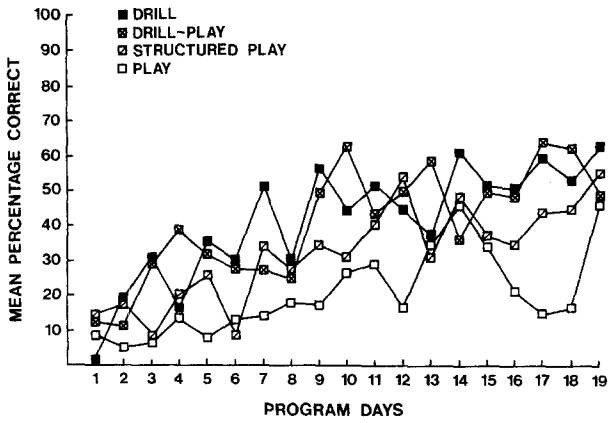

FIGURE 2. Performance of 12 children on an experimental phonology program administered in four structural modes (Study A).

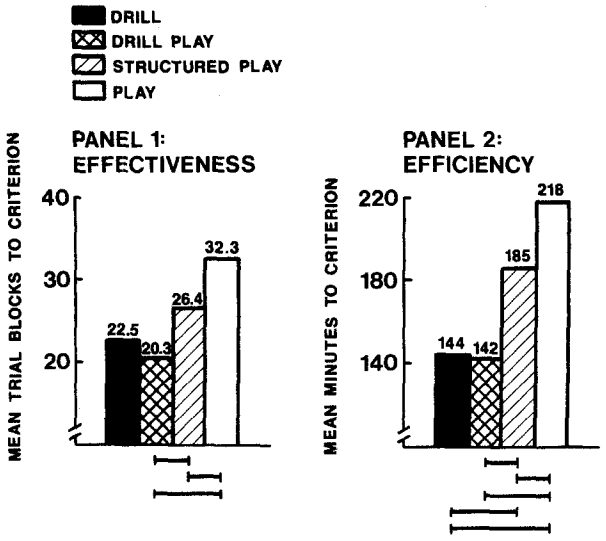

FIGURE 3. Performance of 10 children on an experimental management program administered in four structural modes (Study B). Panel 1 illustrates the mean number of trial blocks needed to reach criterion in each mode for each of the first six program steps; Panel 2 illustrates the average total time for subjects to reach criterion at Step 6 in each of the four modes. Statistically significant differences between performance data in each pairwise comparison are indicated by connecting underbars (*Wilcoxon Signed-Ranks Tests* (Siegel 1956), $p < .05$.

parametric statistical analyses. Results are similar across the two studies and suggest that structural modes can be differentiated in the following ways.

First, data in Figure 2 (Study A) suggests that Drill and Drill Play modes are generally more effective than Structured Play and Play modes. Trends over sessions show Drill and Drill Play data points overlapping, but distinct from Structured Play and Play. Individual tallies over all program days indicate that children performed as well or better in Drill and Drill Play modes on 54% and 53% of days, respectively, than they performed in the other two modes. In contrast, Structured Play was equal to or better than the other modes on only 37% of program days; Play was equal to or better than the other modes on only 27% of days. Moreover, data in Figure 3 (Study B) indicate Drill Play was significantly more effective than Structured Play and Play modes. Wilcoxon tests (Siegel, 1956) for the significance of differences in the number of trial blocks to criterion in each of the three modes are given in Figure 3, Panel 1. These data from both Study A and Study B suggest that Drill and Drill Play are more effective than Structured Play and Play modes. A conservative interpretation, also, is that Drill Play is at least as effective as Drill mode.

Second, Figure 3, Panel 2, provides evidence for the comparative efficiency of the four structural modes. Wilcoxon tests for significance indicate that both Drill and Drill Play modes were significantly more efficient than Structured Play and Play, but were not significantly different from one another. Hence, the presumed extra time needed for the ME_A in Drill Play did not significantly increase the overall time-to-criteria data.

In answer to the first question, these group data indicate that Drill and Drill Play modes are more effective and more efficient than Structural Play and Play modes, with Drill Play at least as effective and at least as efficient as Drill.

Are Certain Modes More Effective or Efficient for Certain Subgroups of Children?

Although the averaged group data indicate that Drill and Drill Play modes were more effective and efficient than Structured Play and Play, we wondered whether individual differences were present among children. Specifically, was a child's coding on a diagnostic classification system (Shriberg & Kwiatkowski, 1982a) associated with differential performance among the four modes?

To explore individual trends for each child, several performance indices were constructed for quantitative analysis of the data from Study A and Study B. Briefly, for each day in which a child experienced management on the same program in several modes, performance difference scores were derived to reflect the relative effectiveness of management in each mode. These difference scores were then summed, percentaged, and algebraically ordered to yield an index of each child's performance along a dimension from "Driller" to "Player."

Average difference scores approaching "0" indicated little difference in performance in the four modes: average difference scores departing from "0" in either a negative or positive direction indicated better performance in Drill/Drill Play or Structured Play/Play, respectively. These data were inspected relative to the causal-correlates index assigned to each child as described in (Shriberg & Kwiatkowski (1982a). At issue was whether children's Driller-Player indices were associated with their status on three causal-correlative factors in phonological disorders: Mechanism, Cognitive-Linguistic, and/or Psychosocial involvement.

The results of several analyses of this type were essentially negative. Those children whose performance in the two drill modes was better than in the two play modes, "Drillers" did not share common classification indices. Moreover, the children who had higher performance in the play modes, "Players," did not share any particular 3-digit classification index (Level 4) (see Shriberg & Kwiatkowski, 1982a, for these "level" designations), 6-digit classification code (Level 5), or summary assessment data ratings (Level 6). Hence, although individual differences were apparent in the impact of the mode of management on effectiveness and efficiency, these differences were not captured by classification entries. As indicated in the following discussion, such independent variable information may be available in part, only at a more sensitive level of description of children roughly located beyond Level 6 data.

What Are Clinicians' Perceptions of the Four Management Modes?

A major impetus for these studies of management modes was the concern that clinicians should enjoy management sessions for young children with delayed speech. As noted earlier, the behaviorism of the 60's and 70's emphasized technical formats that many clinicians and paraprofessionals have found too constraining. The proliferation of articulation "programs" for children with residual articulation errors has had both positive and negative consequences. Clinicians want to be effective and efficient with preschool children with delayed speech, but scaled-down versions of articulation programs do not work with very young children. That is, neither children nor clinicians are wholly comfortable with procedures that call for what is defined here as Drill mode.

To assess clinicians' perceptions of management in these modes, questionnaires were distributed to clinicians at the completion of Study B and Study C. For Study B, clinicians rank-ordered the four modes in response to each of four questions (4 = "most"; 1 = "least"): (a) Which mode do you think was most effective for the children with whom you worked? (b) Which mode do you think was most efficient for the children with whom you worked? (c) Which mode did you personally prefer most in working with the children? (d) Which mode do you think the children you worked with most preferred? Space was provided for clinicians to state their reasons for their rankings on each question. In Study C, a questionnaire was structured somewhat differently in an attempt to probe in detail the reasons why clinicians chose particular structural modes for each of their individually constructed programs. In Study C, clinicians had chosen to use Drill Play and Structured Play modes far more frequently for their programming for each child than they had chosen the other two modes.

Figure 4 summarizes clinicians' responses to the four questions posed in Study B. Statistically significant differences between the averaged rank orderings (Siegel, 1956) are indicated by the connecting underbars. Overall, clinicians' independent rankings were remarkably similar, yielding even for this small number of clinicians several statistically significant differences in the rank orderings. Clinicians were of the opinion that Drill Play was most effective and most efficient for their clients, and they personally preferred Drill Play. From their view, they felt that children preferred Play, Structured Play, and Drill Play more than Drill. Differences in preference for Play and Structured Play versus Drill Play were not significant.

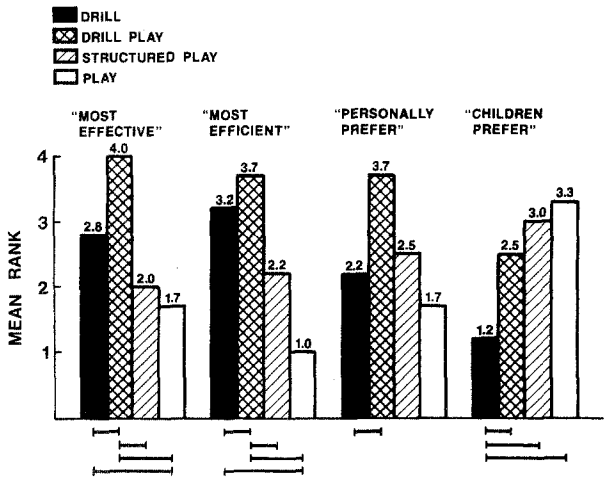

FIGURE 4. Responses of six student clinicians to four questions about the four structural modes (4 = "most"; 1 = "least"). Statistically significant differences in rank ordering for each pair-wise comparison are indicated by connecting underbars (*Wilcoxon Signed-Ranks Test* (Siegel 1956) $p < .05$.

Content analysis of the anecdotal information supplied by clinicians in Study B, and especially in Study C, points clearly to several differences associated with the structural modes. Words such as "motivation", "incentive", "involvement", "comfortable", "smooth", "fun", "tedious", "intensive", were used by clinicians in both studies in describing their impressions of the children's state of mind and their own state of mind in the different management modes. This level of description concerns the affective domain, in contrast to the technical domain of management content. Modes did engender large differences in the affective domains of both children and clinicians. Overall, clinicians' comments in both studies

indicate that the critical element was the match between child and structural mode. They felt that certain children generally were best in one mode or another, a fact borne out by the performance data described earlier. For the same child, however, they felt that certain management tasks were best accomplished in one mode or another. They noted that clinician consistency within modes was quite important. Children needed to know what the "rules of the mode" were and clinicians needed to stick to these rules.

Overall, clinicians' anecdotal impressions were that three factors dictate choice of management mode: (a) a general knowledge of the child's personality, (b) the intended target response, and (c) the stage of management. Clinicians enjoyed working in whatever mode seemed appropriate for the child, the target behavior, and the stage of management. That is, even Drill was acceptable if the clinician truly felt that it yielded the most effective and efficient learning for a particular child on a target behavior, and at a specific stage in management.

SUMMARY

Data from the three studies suggest that the structure of a management program for young children with delayed speech is as important as the choice of program content. Keeping in mind the size and scope of these studies, these data refute a position that stimulus-response paradigms (Drill) should be selected as the management structure of choice. For preschool children in particular, a certain element of play (Drill Play, Structured Play, or Play) appears to be not only defensible, but in some situations, preferable to Drill. Clearcut guidelines for the selection of an appropriate management structure for individual children have not emerged from these studies, however. The choice of mode appears to require sound clinical judgment from a person acquainted with the child's personality. Such a view would appear to have important implications for service delivery questions. So-called "universal" phonology management programs that focus only on content may fail to account for critical client-clinician factors in the affective domain. As in all areas in education, the task is to create an optimum balance between an environment favorable to learning, and efficient delivery of the technical elements of that which is to be learned.

THE CONTENT OF MANAGEMENT PROGRAMS FOR PHONOLOGICAL DISORDERS

If the arrangement of structural elements may be considered the "how" of a management program, the content of each element defines the "what." The final section of this paper reviews historical approaches to program content and offers observations on contemporary and future directions. This synthesis assumes the reader's familiarity with a diagnostic classification system (Shriberg & Kwiatkowski, 1982a) and with the basic concepts of intervention (see Figure 1) and the basic elements of management (see Table 1) presented earlier in this paper.

Historical Perspectives on the Content of Management

Table 4 is a selective chronology of the major approaches to management of children with delayed phonological development. These nine approaches sample only major trends in the U.S.A. during this century. With reference to the basic concepts and elements of management and the diagnostic classification system, two observations are of interest.

The first observation to be made about the approaches listed in Table 4 is that fairly direct parallels in causal emphases with that proposed in the diagnostic classification scheme may be observed. Specifically, a mechanism emphasis is evident in the approaches to management proposed by Scripture and Jackson (1927), Stinchfield-Hawk and Young (1938), and McDonald (1964); a cognitive-linguistic emphasis is apparent in approaches associated with McReynolds and Bennett (1972), Compton (1975) and Ingram (1976); and, a psychosocial emphasis is evident in the writings of Backus and Beasley (1951) and Van Riper (1939), although Van Riper's approach is more eclectic. Standing by itself, appropriately, are approaches derived from Skinnerian learning theory—Mowrer, Baker, and Schultz (1968). Behaviorist approaches eschew etiological, causal variables; rather, they focus on precise specification of the structural elements of management. Other approaches to management not listed in Table 4 may also fall within the three causal-correlative emphases, although most of the more recent approaches for children with residual phonological errors are based almost solely on behaviorist approaches.

A second observation is that although the approaches listed in Table 4 employ different types and sizes of target responses, each includes comprehension tasks at Point A (see Figure 1), production tasks at Point B, and production-comprehension tasks at Point C. That is, in review of the original references listed in Table 4, each author includes at least some mention of the need for "discrimination," "monitoring," and other comprehension activities in addition to production practice on the target response. Differences among procedures involve the precision of definition of these tasks and their placement in the overall sequence of management stages. For example, Van Riper (1939) schedules listening activities early in management, while behaviorist approaches schedule comprehension activities only at later stages when target responses have been well-established in the client's productive repertoire. A fully developed comparative analysis of these and other approaches would specify in detail how each approach deals with such content. Within the scope of this paper, it is sufficient to note that a clear trend across these ap-

TABLE 4. History of major approaches to management of children with developmental phonological disorders

Approximate Chronology	*Person(s)*	*Key Term*	*Type/Size of Basic Unit (TR_I)*	*Emphasis: Theory into Practice*
1920's	Scripture & Jackson (1927); others	Phonetic Placement	Phoneme	Phonetic drills; emphasis on production practices
late 1930's	Stinchfield-Hawk & Young (1938)	Moto-kinesthetic	Phoneme	Manipulation of articulators; emphasis on kinesthetic sensations
1940's	Van Riper (1939)	Ear training	Phoneme	Graded linguistic complexity; emphasis on listening, motivation
1950's	Backus & Beasley (1951); others	Self concept	Word	Socialization activities; emphasis on communication within group process
early 1960's	McDonald (1964)	Phonetic context	Syllable	Ballistic movements; emphasis on graded articulatory complexity
late 1960's	Mowrer, Baker, & Schultz (1968); others	Production training	Phoneme	Drills to establish and transfer; emphasis on stimulus control, efficiency
early 1970's	McReynolds & Bennett (1972); others	Distinctive feature	Classificatory or phonetic feature	Comprehension and production of feature classes; emphasis on maximizing response generalization
mid 1970's	Compton (1975); others	Generative phonology	Realization rule	Contrastive comprehension and production practice; emphasis on modification of realization rules
late 1970's	Ingram (1976); others	Natural phonology	Simplification processes	Contrastive comprehension and production practice; emphasis on cognitive developmental perspective

proaches favors Point A and Point B tasks, with much less emphasis on well-developed tasks at Point C. As discussed presently, the requirement that children generalize and maintain newly learned behaviors (i.e., carryover) makes such tasks a necessary component in successful management programs. Interestingly, for certain target responses in the phonological domain, such tasks may also be necessary for response acquisition.

Current Perspectives on the Content of Management

At the beginning of the seventh decade of research and practice in developmental phonological disorders in this country, the major question remains unanswered: What type of intervention most effectively and efficiently will enable a child to acquire and maintain intelligible speech? Currently, the speech-language clinician can select from a number of published materials a program that might be successful for a child with residual phonological errors (Bernthal & Bankson, 1981; Shriberg, 1980). For the child with delayed speech, however, clearly effective and efficient programs have not yet been documented in the research literature. It is useful to examine some published and emerging approaches; Table 5 is a sample of six procedures available to readers. Other approaches are becoming available in workshops and convention papers. Revisions in emerging programs are necessary as normal data in child phonology and the returns from field testing warrant change. Revisions of Hodson's (1978) seminal work, for example, continue (Hodson, 1981). Comparative analysis of the six programs in Table 5 focuses only on those conceptual elements (see Figure 1) and structural elements (see Table 1) that are relevant for present purposes. Four observations afforded by these entries in Table 5 warrant brief comment.

First, these approaches are not oriented to possible causal-contributing factors to the phonological delay across children. As developed earlier, recent focus has been almost exclusively on linguistic phenomena. Clinical experience with this population will readily confirm that each child is in some way "different." Nevertheless, the trend to bypass individual differences in favor of developing universalist programs seems to continue for children with delayed speech much as it did during an earlier behavioral period concerned with programming for children with residual speech errors. That is, the emphasis has shifted from structure (e.g., schedules of rein-

TABLE 5. Some current management approaches for children with a developmental phonological disorder.

Approach	*Entry Point(s) (See Figure 1)*	TR_I	TS_B	*RD*	IE_A	IE_S
Ferrier & Davis (1973) Lexical Approach	B	11 phonemes including nasals, stops, fricatives and liquids	Pictured stimuli. 5 blocks of 5 CVC *minimal pairs* (final consonants differ)	RD_2 = "inclusion of any final sound." When TR_1 = 50% at RD, change to RD_1. RD_2 = "articulation of only the correct final sound."	Child taught to recognize name of each picture; child prompted to name pictures as they are lined up in 3-word sets.	Unspecified
Ingram (1976) 1. Eliminate Instability (pp. 141-142)	B	Whatever surface form matches the child's underlying form of a word	Only the word with unstable surface forms	The surface form that precisely matches the underlying form (including all diacritical markings)	Evoke tokens of the word	If TR_0 = RD, "accept it"; if $TR_0 \neq$ RD, "reject it."
2. Eliminate Homonyms (pp. 141-142)	(Unspecified; presumedly B)	Whatever processes that would eliminate homonyms	(Unspecified; presumedly one or several pairs of homonyms)	(Unspecified; presumedly phonemic accuracy)	(Unspecified; presumedly same as above)	(Unspecified; presumedly same as above)
3. Establish New Contrasts (pp. 143-148)	(Unspecified; presumedly B)	Contrasts (vowel-consonant) that "result in a system comparable to that used by young children" i.e., ordered developmentally	"Wide variety of words"	(Unspecified; presumedly same as above)	(Unspecified; presumedly same as above)	(Unspecified; presumedly same as above)
Blache (1978) Minimal Pairs Program	A, B	A feature difference	"Culturally significant words"—expansion to phrases, sentences	Correct feature	Picture cards "Touch the words I say" (Point A) "I'll touch the words you say" (assumedly Point B)	If $TR_0 \neq$ RD: Model—"Were you trying to say this word, ____?" Also, use any traditional cue used to teach the sound in isolation (list of cues provided)
Wiener & Ostrowski (1979) Communication-Based Program	B A/C	Any fricative or affricate error (except /h/ or /ʒ/)	Pictured stimuli. Common monosyllable words with TR_I in initial or final position	Unspecified in each phase	First phase (B): Child selects and names picture Second phase (A/C): Child *discriminates* whether clinician's response matches child's first response and answers: "(Yes) (No) I said ____" Third phase – IE_A Clinician may use placement cues for practice on TR_I	Clinician says: Did you say *(TR_I), (TR_0, (other error)*?

forcement) to content, but the content assumes that the error pattern itself provides a sufficient focus.

Second, these approaches generally emphasize Points A and B comprehension and production tasks. With the exception of the novel procedure described in the brief report by Weiner and Ostrowski (1979), these newer programs seem to remain tied to a traditional emphasis—the child discriminates clinician-produced stimuli (Point A) or the clinician passes judgement on child-produced stimuli (Point B). Although the linguistic targets and training stimuli may be selected to actualize phonological contrasts, these approaches generally assume that acquisition of that response requires Point A and/or Point B tasks. Typically, Point C tasks, if scheduled at all, occur later in the service of response transfer.

Third, these approaches are variably demanding relative to clinicians' knowledge of phonological analysis procedures. Ingram's procedures appear to call for considerable proficiency in these areas, particularly in narrow phonetic transcription skills. To ascertain which of several surface forms is the child's underlying form for a lexical item, for example—or to determine which phonological processes are most associated with lexical items—these are tasks that require specific training. Indeed, considering the level of abstraction and reliability problems involved, it is doubtful that any two workers would produce similar analyses. On the other end of the scale, the choice of target responses in the other three procedures (see Table 5) might strike linguistically-minded clinicians as derived from only surface-level analyses. To the linguist, the selection and sequencing of target responses is the very point of infusing the clinical literature with the descriptive-analytic procedures of adult and child phonology.

Fourth, these approaches rely on traditional procedures for dealing with incorrect responses. As with the earlier programs for children with residual errors, the approaches here do not address the need for systematic use of subsequent instructional events. Clinical experience suggests clearly that the training moment is what the clinician has the child do after a failure.[2] Even for

[2]In the studies described earlier, for example, we explored several types of subsequent instructional events. Most promising was the transitive sequence *Repeat-Simplify-Modify*. That is, after a trial failure, the clinician would first allow a second trial (Repeat); if the child failed, the clinician would Simplify the training stimulus (for example, by deleting a nontarget sound or syllable); if the child again failed, the clinician would Modify the training stimulus in some way that least denigrated its structural form (e.g., by exaggerating the target in duration, intensity, or pitch).

TABLE 6. Some programming considerations for individual differences among children with delayed phonological development.

Consideration	*I* *Mechanism Emphasis*	*II* *Cognitive-Linguistic Emphasis*	*III* *Psychosocial Emphasis*
Description of the *Modal* Child	Speech delay associated with structural and/or functional deficits—as historical and/or maintaining factors	Speech delays associated with cognitive and/or linguistic functioning—as historical and/or maintaining factors	Speech delays associated with input deficits and/or social behaviors—as historical and/or maintaining factors
Phonological Locus of Intervention	Surface forms	Underlying forms; Phonological rules	Sociolinguistic forms (pragmatics)
"Message" to Child (program goal)	"Tune up your speech—preserve intelligibility in increasingly longer units"	"Develop your speech-language—match intelligibility to the level of your cognitive-linguistic functioning"	"Increase your desire for communication—increase the frequency of intelligible communication with others"
Technical Areas Underlying Program Development	Speech development; speech motor control; motor skills learning	Language development; cognitive development; concept learning	Child development; child psychology; preschool educaton
Selection and Sequencing of Target Responses (TR_I)	Develop support systems including suprasegmental; select and sequence targets by a phonetic logic	Select and sequence targets by a developmental logic, including both language and cognitive structures	Select and sequence targets that subserve linguistic responsiveness
Selection and Sequencing of Training Stimuli (TS)	Select training stimuli on basis of their structural properties—e.g., canonical shape, length, phonetic features. Drill on *small*, well-controlled sets.	Select training stimuli on basis of their linguistic properties—e.g., grammatical function, lexical category. Include *large* sets from which the TR_I can be abstracted.	Select training stimuli on basis of their pragmatic properties—e.g., sharing information, turn taking. Include large sets from which the TR_I can be abstracted
Instructional Focus	Precise knowledge of results in the sensorimotor realm (acoustic, proprioceptive)	Precise knowledge of results in the semantic realm (intelligibility, meaning)	Precise knowledge of results in the interpersonal realm (affect, communication)
Mode-By-Stage Considerations	Drill/Drill Play modes early for acquisition; Structured Play/Play modes later for transfer	Drill Play/Structured Play modes early for acquisition; Play mode later for transfer	Play mode early for acclimation; Drill Play/Structured Play mode later for acquisition; Play mode later for transfer

the newer programs that purportedly address a child's phonological "rules," attention to the variable surface forms following incorrect responses may be critical to response acquisition.

In summary, current approaches to management for children with delayed phonological development are diverse in their selection of target responses and in the corresponding skills required of the clinician. Common to these approaches, however, is an emphasis on phonological contrast—however operationalized—and deemphasis on the phonetic-level training of surface forms. Missing from the current literature is concern with differential diagnosis as a guide to the structure and content of management. The view proposed in this series of papers asserts that effective and efficient programs are best developed from a diagnostic framework. A preliminary sketch of this view is presented next in the final section of this paper.

Future Perspectives on the Content of Management

The classification system and management overview presented here are offered as a framework for practice and research in phonological disorders. Table 6 is organized to highlight directly differences in instructional content that might follow from a diagnostic classification system. The entries in Table 6 admittedly are speculative. They follow from a unified framework, however, and they are amenable to programmatic research. What message will the child receive from the management process? What bases will the clinician use to select and sequence target stimuli and to arrange for effective instructional stimuli? The suggestions here are that management programs for delayed speech must carefully detail each element in Table 1, including both structural considerations (mode) and all content factors. A valued research goal would be a library of documented programs that would be at least a first approximation to the individual needs of children within each of the three causal-correlates areas. Some children might benefit from a highly technical analysis, involving extensive linguistic analyses and possibly by high technology, such as afforded by computer-assisted biofeedback devices. For other children, possibly with the very same pattern of speech errors, programs involving play and enriched language and affective environment may be both necessary and sufficient. The challenge is to not only develop programs that meet the requirements of entries in Table 6, but to develop reliable ways to determine the proper match of program to child.

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REFERENCE NOTE

1. KENT, R. *Phonological analysis as it touches on sensory-motor concerns*. Presented at the Annual meeting of the American Association of Phonetic Sciences, San Francisco, November 1978.

REFERENCES

BACKUS, O., & BEASLY, J. *Speech therapy with children*. Boston: Houghton Mifflin, 1951.

BELL, A., & HOOPER, J. *Syllables and segments*. Amsterdam, North Holland: North Holland Publishing Company, 1978.

BERNTHAL, J., & BANKSON, N. *Articulation disorders*. Englewood Cliffs, NJ: Prentice-Hall, 1981.

BLACHE, S. Applying distinctive feature theory. In *The acquisition of distinctive features*. Baltimore: University Park Press, 1978.

BRANIGAN, G. Syllabic structure and the acquisition of consonants: The great conspiracy in word formation. *Journal of Psycholinguistic Research*, 1976, *5*, 117-133.

COMPTON, A. Generative studies of children's phonological disorders: A strategy of therapy. In S. Singh (Ed.), *Measurements in hearing, speech and language*. Baltimore: University Park Press, 1975.

COSTELLO, J. Programmed instruction. *Journal of Speech and Hearing Disorders*, 1977, *42*, 3-28.

FERGUSON, C., & GARNICA, O. Theories of phonological development. In E. Lenneberg, & E. Lenneberg (Eds.), *Foundations in language development* (Vol. 1). New York: Academic Press, 1978.

FERRIER, E., & DAVIS, M. A lexical approach to the remediation of final sound omissions. *Journal of Speech and Hearing Disorders*, 1973, *38*, 126-131.

HODSON, B. A preliminary hierarchical model for phonological remediation. *Language, Speech, and Hearing Services in Schools*, 1978, *9*, 236-240.

HODSON, B. Evaluation and remediation of phonological disorders. *Communicative Disorders: An Audio Journal for Continuing Education*, 1981, *6*.

INGRAM, D. *Phonological disability in children*. New York: Elsevier, 1976.

KENT, R. Anatomical and neuromuscular maturation of the speech mechanism: Evidence from acoustic studies. *Journal of Speech and Hearing Research*, 1976, *19*, 421-447.

MACKEN, M. The child's lexical representation: The *'Puzzle-Puddle-Pickle'* evidence. *Papers and Reports on Child Language Development*, 1979, *16*, 26-41.

MCDONALD, E. *Articulation testing and treatment: A sensory-motor approach*. Pittsburg: Stanwix House, 1964.

MCREYNOLDS, L., & BENNETT, S. Distinctive feature generalization in articulation training. *Journal of Speech and Hearing Disorders*, 1972, 37, 462-470.

MOWRER, D. Accountability and speech therapy in the public schools. *Asha*, 1970, *14*, 111-115.

MOWRER, D. *Methods of modifying speech behaviors*. Columbus, OH: Charles E. Merrill, 1977.

MOWRER, D., BAKER, R., & SCHUTZ, R. Operant procedures in the control of speech articulation. In H. Sloane, & B. MacAulay (Eds.), *Operant procedures in remedial speech and language training*. Boston: Houghton Mifflin, 1968.

SCRIPTURE, M., & JACKSON, E. *A manual of exercises for the correction of speech disorders*. Philadelphia: F. A. Davis Co., 1927.

SHRIBERG, L. Developmental phonological disorders. In T. Hixon, L. Shriberg, & J. Saxman (Eds.), *Introduction to communication disorders*. Englewood Cliffs, NJ: Prentice-Hall, 1980.

SHRIBERG, L., & KWIATKOWSKI, J. Phonological disorders I: A diagnostic classification system. *Journal of Speech and Hearing Disorders*, 1982, *47*, 226-241. (a)

SHRIBERG, L., & KWIATKOWSKI, J. Phonological disorders III: A procedure for assessing severity of involvement. *Journal of Speech and Hearing Disorders*, 1982, *47*, 256-270. (b)

SIEGEL, S. *Non parametric statistics for the behavioral sciences*. New York: McGraw-Hill, 1956.

SMITH, N. *The acquistion of phonology: A case study*. Cambridge: University Press, 1973.

STINCHFIELD-HAWK, S., & YOUNG, E. *Children with delayed or defective speech*. Stanford, CA: Stanford University Press, 1938.

VAN RIPER, C. *Speech correction: Principles and methods*. Englewood Cliffs, NJ: Prentice-Hall, 1939.

WEINER, F., & OSTROWSKI, A. Effects of listener uncertainty on articulatory inconsistency. *Journal of Speech and Hearing Disorders*, 1979, *44*, 487-493.

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