
Decision Making in Assessment and Early Intervention Planning

Elizabeth R. Crais

Joanne E. Roberts

University of North Carolina—Chapel Hill

This article presents a series of decision trees to help in planning assessment and intervention with handicapped children between 3 months and 5 years of age. The decision trees consist of a series of assessment questions leading to suggestions for intervention. Steps in using the decision trees are described and a case example presented.

KEY WORDS: screening, decision-making, communication assessment, preschool assessment, preschool intervention

For many speech-language pathologists (SLPs) working in the schools, the recent mandates of P.L. 99-457 (1986) will expand the populations of children who will receive speech and language services. The new legislation proposes services for handicapped and at-risk 3- to 5-year-old children and provides incentives for states to begin providing services for handicapped and at-risk birth to 3-year-olds and their families. The purpose of this article is to present a series of decision trees to help in assessment and intervention planning with young handicapped children. First, a rationale for use of the decision trees is presented, followed by the decision trees themselves and their description. Finally, a case example is presented to illustrate the use of the decision trees in assessment and intervention planning.

Rationale

When speech-language pathologists (SLP) assess young children, three issues are immediately encountered. First, a limited number of standardized instruments for the birth to 5-year-old population are available, with even fewer measures available for the birth to 3-year-old range. Second, the instruments that do exist are narrow in scope and often omit important assessment areas. In a survey by Crais and Leonard (1990) of graduate training programs, of the tests used "routinely" to assess the birth to three population, few include items that deal

with early social routines or communicative intentions. A third issue facing SLPs is the difficulty in relating the results of standardized testing to specific intervention goals. For example, a receptive or expressive age score may provide an estimate of the child's developmental level, but may have limited utility in selecting specific goals for intervention. Indeed, a number of clinicians and researchers (Leonard, Prutting, Perozzi, & Berkley, 1978; Miller, 1981; Muma, 1978) argue against the sole use of standardized testing and encourage a combined use of standardized and nonstandardized (i.e., informal observation) assessment measures.

As an alternative or addition to standardized testing, this article proposes a set of decision trees developed for planning assessment and intervention with very young children. Decision trees by design include a sequenced set of questions followed by available response choices. The decision trees presented here can be used to organize the types of questions to be asked and to help the SLP make decisions about the need for further assessment. The decision trees focus on handicapped and at-risk children functioning developmentally between the ages of 3 months and 3 years, recognizing that many of the children seen for early intervention are chronologically older yet developmentally within this range. Clearly, for some children, particularly those with severe or multiple handicapping conditions or those who are medically fragile, the assessment and intervention activities may need to be modified. The SLP, in conjunction with other care providers, can determine each child's capabilities and limitations, and can carefully apply that knowledge to the use of the decision trees. Furthermore, use of the decision trees presumes some background and familiarity with such areas as prespeech and language, play, social routines, gestures, intentions, and parent-child interaction. For the SLP needing additional information in these areas, the following sources can be useful (Carlson & Bricker, 1982; Chapman, 1981; Dunst, 1981; Dunst & Wortman-Lowe, 1986; Golinkoff, 1983; Roth & Spekman, 1984; Seibert & Hogan, 1982).

THE DECISION TREES

Decision trees are provided for children functioning at the prelinguistic (Figure 1), one word (Figure 2), and multiword (Figure 3) stages. The trees include sets of questions to assess a child's current level of communication functioning and activities to guide intervention planning. Each decision tree is divided into three major domains: Social Interaction, Comprehension, and Production. Production has been further divided into two subdomains: (a) Spontaneous and (b) Imitative Production. Although each domain is presented as discrete, any one behavior *within* a domain typically incorporates aspects of the other domains.

The questions in the decision trees were drawn from several published sources (Brown, 1973; Miller, 1981; Retherford, Schwartz, & Chapman, 1981; Seibert & Hogan, 1982; Snyder-McLean, Sack, & Solomonson, 1985) as well as our own clinical experiences. The individual assessment questions and intervention activities are listed in a developmental sequence from early developing to later developing. Because some behaviors develop simultaneously, however, the sequence should not be viewed as invariant. The assessment questions serve as a basic framework and are not presented as an absolute progression of each child's communication skills. As noted by Yoder and Kent (1988), decision trees should be used as "guidelines" and "prompts" for assessment and management rather than as definite programs for clinical intervention.

Most of the behaviors addressed in the decision tree questions can be elicited through interaction with the child and from parent or caregiver interviews. For prelinguistic children, the focus is on early developing social and interactive aspects of communication. If a child uses only gestural and vocal behaviors, we believe the focus in assessment should primarily be on determining whether these behaviors represent functional communication. For verbal children, the focus remains on the functional and interactive aspects of communication; thus, assessment of semantics and pragmatics rather than phonology or syntax are highlighted.

Steps in Using the Decision Trees

Selecting the stage to begin. Initially, the clinician can use information from a completed case history form, parent interview, and other referral information to establish which of the decision trees appears most suitable. The SLP should then become familiar with items from each domain on the decision tree, perhaps highlighting in different colors items to be looked at with a particular child.

Preparing for the assessment. The SLP could then set up an interactive play setting with the child to observe and elicit a range of communicative behaviors (e.g., types of initiations, modes of communication, intentions displayed). By structuring situations to elicit the communi-

cative behaviors addressed in the assessment questions, the SLP can record the behaviors that are readily used by the child and look for those that are emerging. The parent or teacher may also be asked to describe: (a) *what* communicative behaviors the child uses, does not use, or is learning to express (i.e., requests for objects or attention); (b) *how* those behaviors are typically expressed: nonverbally (i.e., gesture, body movement, and facial expression), vocally (i.e., speech sounds or nonspeech sounds), or verbally (i.e., speech or signing); and (c) in *what situations* they are usually exhibited.

Recording the information. The clinician can use a plus (+) for questions with positive responses, a minus (-) for those failed, and a plus/minus (+/-) for questions which result in inconsistent or questionable responses. Throughout the interactions, the clinician can place these marks directly on the decision trees next to each item administered or observed. In addition, the SLP can add examples of behaviors and other brief notes about the child's communicative efforts.

In using the decision trees, it is also important to remember that opportunity plays a part in the skills that are exhibited by a child, both in terms of the opportunities previously provided and those available in the immediate environment. For example, the type as well as the frequency of interactions that are initiated, responded to, and encouraged by parents or teachers often shape the kinds of behaviors the child displays. Talking with the parent(s) or teacher(s) and also observing them interacting with the child will help clarify the communicative interaction opportunities routinely available to the child. In addition, if a child did not exhibit a target behavior during the assessment, this does not mean that the child *cannot* perform the behavior. Providing the context for the child to act does not always mean the child *will* act. Therefore, both previously and currently provided opportunities must be considered.

Moving through the assessment. The next step in using the trees is for the SLP to select one domain and move vertically through the list of questions, stopping where the child either does not demonstrate a few consecutive behaviors or does so only in a limited or inconsistent manner. Once the child's current level of functioning is established within one domain on the decision tree, the SLP should then move through the other two domains. Although the three decision trees are presented separately, within any one domain, the SLP may need to move back and forth among the trees to explore a child's full range of communication skills.

Seeking additional information. At any point in the process, the items within a domain that were failed or that were inconsistent or questionable (+/-) can be readministered. Further analysis in any of the domains can also be initiated by using developmental scales or informal procedures to identify additional behaviors between the achieved and unachieved questions. Some useful instruments are: Communicative Intention Inventory (Coggins & Carpenter, 1981), Hawaii Early Learning Profile (Furuno, O'Reilly, Hosaka, Inatsuka, Allman, & Zeisloft, 1979), Parsons Preschool Curriculum (Snyder-McLean,

Sack, & Solomonson, 1985) and Communication and Symbolic Behavior Scales (Wetherby & Prizant 1990). In addition, information about the developmental levels of other domains (e.g., motor play, cognition) is important. The SLP can turn to standardized instruments or developmental scales such as the Batelle Developmental Inventory, (Newborg, Stock, Wnek, Guidubaldi, & Svinicki, 1984) to assess motor skills; the Symbolic Play Scale (Westby, 1980) and Assessing Prelinguistic and Early Linguistic Behaviors (Olswang, Stoel-Gammon, Coggins, & Carpenter, 1987) to assess play and cognitive skills; and Miller, Chapman, Branston, & Reichle's (1980) article to assess sensorimotor cognitive skills.

Selecting goals and activities for intervention. As the first step in planning intervention for a child, the clinician can examine the questions on the decision trees for the behaviors that *were* and *were not* displayed. Using the suggested activities in Figures 1–3 as guidelines, specific goals for the child can then be developed. In planning an intervention program, the SLP can begin by focusing on the highest level question in each domain that the child *did* achieve in order to expand upon the child's available skills and to build in an upward and outward fashion from where the child currently functions.

When developing individual goals from the decision trees, the clinician should ask the following questions: (a) Is this goal important to the child's development?, (b) Will it improve communication in a substantial manner?, and finally, (c) Why should this particular goal be selected for intervention? As long as the three answers represent activities performed or needed in the child's daily life, then those activities should be implemented for a particular goal. However, when the answers to the questions include a "no" or an "I'm not sure," then the clinician must rethink the need for, and ultimate selection of, those goals.

Case Example for Using the Decision Trees

To illustrate the use of the decision trees for assessment and intervention, a case study of an 18-month-old child, Ellen, will be described. On the case history form, Ellen's parents noted that she makes "lots of sounds" but does not use "real" words yet and that she clearly expresses some desires (e.g., not wanting to go to bed). Through use of the prelinguistic decision tree (Figure 1), Ellen's communicative behaviors were observed and elicited during two activities, playing with toys and eating a snack. Initially, Ellen and the clinician played on the floor with a ring stacking toy, blocks, baby doll, blanket, baby bottle, stacking cups, windup toy, and teddy bear. The clinician later brought out juice, cups, and graham crackers, served herself juice, and watched for Ellen to request juice or crackers and to gain the clinician's attention. The following is an overview of the results of the interactions. For each of the assessment questions on the prelinguistic decision tree, Ellen's score (+, -, or +/-) and examples of her behavior during the activities are provided in Table 1.

Social Interaction. Ellen was successful in eliciting interactions and responding to an adult in play routines. She expressed herself nonverbally using grabbing and pointing to request juice, exhibited a frown when her mother took away her doll, and showed and gave objects. She did not, however, express any intentions using verbal means.

Comprehension. Ellen looked at objects mentioned and responded appropriately to one common routine when contextual cues were present (i.e., she lay down for diaper changing when her mother felt her diaper and said, "let's change your diaper"). However, when her mother did not give her the physical cue of touching her diaper, she did not react to the phrase "let's change your diaper."

Spontaneous production. Ellen's vocalizations consisted of consonants and syllable repetitions, however; her use of vocalizations was limited (i.e., no repetition of varied syllables, rising intonation, or jargon).

Imitative production. Although Ellen imitated some motor and oral-motor actions and nonspeech sounds, she did not imitate any speech sounds or word approximations.

Planning Goals and Objectives

To demonstrate the use of the decision trees in planning an intervention program, Table 2 lists several goals and objectives for Ellen. For each domain, one to two goals are described below.

Social interaction. Because Ellen was able to both initiate and respond during play interactions, the first goal consisted of expanding Ellen's existing interactions while shaping and developing new routines. Starting with actions that are already within Ellen's repertoire (e.g., she requests toys by holding out her hand), the clinician can add new components from other routines (e.g., prompting Ellen to reach out for the peek-a-boo blanket), and then move to new actions (e.g., taking and giving back the blanket). The purpose of these activities is to further Ellen's ability to participate in longer and more varied routines. The second goal, to increase the vocal expressions of communicative intentions, may be achieved within many of the same activities described for the first goal. See Dunst (1981), Fey (1986), and Hart and Risley (1978) for other suggestions on developing infants' and young children's early social routines.

Comprehension. Because the assessment questions indicated that Ellen could recognize labels of several objects, Ellen's comprehension vocabulary should be expanded while developing her ability to indicate recognition consistently through choosing a named object or acting on it in a specified way. The clinician can play hiding and finding games with common objects while labeling them (i.e., "Where's the X?"). It is helpful to use highly motivating activities such as water play where the child chooses a toy while the clinician labels it. Later, the activity can include the clinician requesting specific toys and the child responding to her request. Because Ellen's comprehension skills are at a slightly higher level than her production, the second goal focuses on increasing

TABLE 1. Summary of assessment results using the prelinguistic decision tree to assess play and snack interactions with Ellen.

Domain	Assessment Number	Prelinguistic Decision Tree	
		Score	Example Behaviors Observed
Social Interaction	#1	+	Elicited attention by vocalizing to request bottle.
	#2	+	Responded by vocalizing "ah ah" when clinician held out bottle.
	#3	+	Elicited attention by vocalizing & waving block while handing block to clinician.
	#4	+	Held up block to show Mom.
	#5	+	Gave block to clinician.
	#6	+	Participated in play routine by gesturing to clinician to put block in box.
	#7	+	Continued play activity by holding up shirt in "tickle" game.
	#8	+	Displayed variety of nonverbal intentions: grabbed and pointed at juice indicating request, frowned to protest Mom taking doll.
	#9	-	Did not exhibit verbally any intentions.
Comprehension	#1	+	Reacted to voice by turning head.
	#2	+	Looked at blocks pointed to by clinician.
	#3	+	Acted on block by picking it up when pointed to by clinician.
	#4	+	Acted on bottle by picking it up when Mom said "bottle."
	#5	+	Layed down when Mom touched diaper and said, "Let's change your diaper".
	#6	+	Hugged doll when clinician said, "hug dolly."
	#7	-	Did not look for absent doll when clinician said, "Where's dolly?".
	#8	-	Did not respond when Mom said from a distance, "Let's change your diaper."
Spontaneous Production	#1	+	Vocalizes frequently.
	#2	+	Produced /m/, /b/, /g/.
	#3	+	Produced "bababa."
	#4	-	No alternating syllables heard.
	#5	+	Refused graham crackers by saing "unh unh."
	#6	-	Did not use vocalization with rising intonation.
	#7	-	Did not use jargon vocalizations.
	#8	+	Did use same vocalization "ag" repeatedly to indicate juice.
	#9	+	Pointed when vocalizing "ah."
	#10	-	Did not use word approximations.
Imitative Production	#1	+	Imitated clinician's motor actions by holding up blanket in "peek-a-boo."
	#2	+	Imitated clinician's oral motor actions by smaking lips when eating cracker.
	#3	+	Imitated nonspeech sounds by coughing after clinician.
	#4	-	Did not imitate speech sounds.
	#5	-	Did not imitate sounds with motor actions.
	#6	-	Did not imitate word approximations.
	#7	-	Did not imitate any one-syllable words.

comprehension of semantic relations between words (e.g., action + object, "eat cookie," or agent + action, "baby sleep"). The clinician can model for Ellen the motor actions and verbal labels for varied semantic relations, beginning with the same action and different objects (i.e., kiss baby, kiss horse) or the same agent and differing actions (i.e., baby eat, baby sleep).

Spontaneous production. Because Ellen only uses limited vocalizations, her vocalizations should be expanded to increase the number of semantic relation categories

expressed. The clinician can begin by using Ellen's existing repertoire of vocalizations and model them combined with some of Ellen's nonverbally expressed semantic relations (e.g., using "ah ah" to indicate recurrence). Later, these vocalizations can be shaped to approximate names for common objects in which Ellen expresses interest. At this time, syntax and phonology were seen as secondary goals and only targeted through work on goals in other domains (e.g., semantics and pragmatics).

Imitative production. Imitating Ellen's motor actions

TABLE 2. Goals and objectives for intervention with Ellen.

I. SOCIAL INTERACTION	
1.	Increase number, length, and diversity of social interactions.
a.	Increase number of interactive games (e.g., "this little piggie," bounce on knee for "horsie").
b.	Increase number of games incorporating recurrence (e.g., child bounces for "more"; holds up blanket for more actions).
c.	Increase use of vocalizations in games, choose same word or syllable to express the game (e.g., "boo" for peek-a-boo).
2.	Increase frequency, diversity, and use of vocalizations and word approximations to express communicative intentions.
a.	Increase number of nonverbal intentions expressed (e.g., commenting by pointing to unusual happenings).
b.	Expand existing vocalizations to other intentions (e.g., requests to protests).
c.	Expand requests to new objects and agents (e.g., first within comprehension vocabulary, later to newly introduced items).
d.	Expand requests to different actions (e.g., go, up, bounce on knee).
e.	Expand protests to combine vocalization + gesture (e.g., "unh unh" and pulling away, when someone pulls toy).
f.	Expand vocalizations of intentions to include use of approximations modeled by clinician (e.g., "oh" for "no").
II. COMPREHENSION	
1.	Expand comprehension vocabulary.
a.	Increase identification of objects, actions, agents. Play games with objects in a bag or box, take out and label them.
b.	Increase comprehension of common actions on objects (e.g., eat, drink, go, sleep, with child as agent).
2.	Increase comprehension of semantic relations.
a.	Increase recognition of different action + object combinations (e.g., eat cookie, eat apple).
b.	Increase type of recognition responses (e.g., eye gaze, pick up, imitate action) for familiar agents, objects, and actions, and their combinations).
III. PRODUCTION	
1.	Spontaneous: Expand vocalizations and word approximations.
a.	Increase use of word approximations for common objects and agents (e.g., "bo" for boat).
b.	Increase use of semantic relations by modeling (e.g., rejection, "unh unh mi" for "no milk").
2.	Imitation: Increase diversity of imitated actions, sounds, and syllables.
a.	Expand imitation of motor acts (e.g., begin with imitation of acts already in child's repertoire, try to incorporate into social games (e.g., wave "bye bye" as part of peek-a-boo).
b.	Increase use of motor acts within child's repertoire combined with vocalizations in repertoire (e.g., wave "bye bye" producing "i-i").
c.	Increase use of new sounds and syllables during sound games.
d.	Increase use of new sounds with familiar motor acts during bathtime, feeding, and playtime.

while producing some of her vocalizations can be useful in building Ellen's interest and ability to produce and imitate varied vocalizations and approximations. The clinician can also introduce "sound games" by vocalizing a sound within the child's repertoire while acting on a toy (i.e., putting rings on a ring toy, throwing blocks into or taking them out of a bucket). As the child begins to produce the vocalization combined with the motor action, the clinician gradually shapes the routine by incorporating more vocalizations and sounds.

Cross-domain goals. Although examples of individual activities are presented for each goal within a domain, activities may meet several goals across domains. For example, the "sound games" activity under *Imitative Production*, encourages social and motor routines while building imitation and spontaneous production skills. In this way, multiple goals are achieved through one activity.

CONCLUSION

In this article, three decision trees were presented to assess communication and plan intervention for very young children. The decision trees provide a nonstandardized assessment method for collecting and organizing information and include ideas for use in intervention planning. With the current focus on serving younger children, the decision trees may be a useful tool for SLPs in assessment and program planning.

ACKNOWLEDGMENTS

Preparation of this manuscript was supported in part by Special Education Programs, Special Education and Rehabilitative Services, U.S. Department of Education, Grant #G008401614, and the North Carolina Council on Developmental Disabilities. We thank Lesley Olswang, Carla Brooks, and Lou Rossetti for their kind remarks on an earlier draft of this paper.

REFERENCES

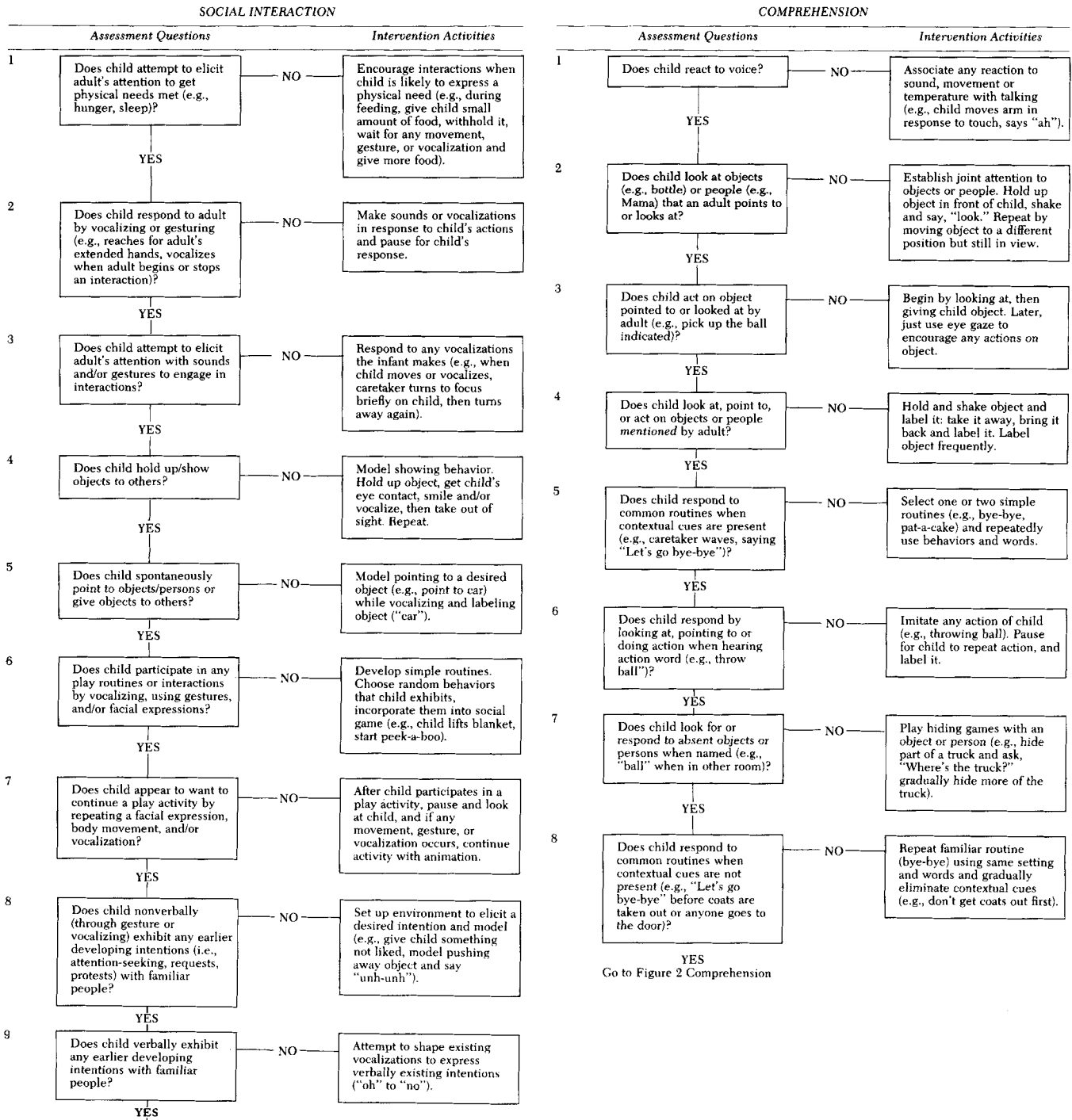
- BROWN, R. (1973). *A first language*. Cambridge, MA: Harvard University Press.
- CARLSON, L., & BRICKER, D. (1982). Dyadic and contingent aspects of early communicative intervention. In D. Bricker (Ed.), *Intervention with at-risk and handicapped infants: From research to application*, (pp. 291-309). Austin, TX: Pro-Ed.
- CHAPMAN, R. (1981). Exploring children's communicative intents. In J. F. Miller (Ed.), *Assessing language production in children*, (pp. 111-136). Baltimore, MD: University Park Press.
- COGGINS, T., & CARPENTER, R. (1981). The communicative intention inventory: A system for observing and coding children's early intentional communication. *Applied Psycholinguistics*, 2, 235-251.
- CRAIS, E., & LEONARD, R. (1990). P.L. 99-457: Are speech-language pathologists prepared for the challenge? *Asha*, 32(4), 57-61.
- DUNST, C. (1981) *Infant learning*. Hingham, MA: Teaching Resources.
- DUNST, C., & WORTMAN-LOWE, L. (1986). From reflex to symbol: Describing, explaining, and fostering communicative

- competence. *Augmentative and Alternative Communication*, 2, 11-16.
- FEY, M. (1986). *Language intervention with young children*. San Diego, CA: College-Hill Press.
- FURUNO, S., O'REILLY, K., HOSAKA, C., INATSUKA, T., ALLMAN, T., & ZEISLOFT, B. (1979). *The Hawaii Early Learning Profile*. Palo Alto, CA: Vort.
- GOLINKOFF, R. (1983). *The transition from prelinguistic to linguistic communication*. Hillsdale, NJ: Erlbaum.
- HART, B., & RISLEY, T. (1978). Promoting productive language through incidental teaching. *Educational Urban Society*, 10, 407-432.
- LEONARD, L., PRUTTING, C., PEROZZI, J., & BERKELY, R. (1978). Nonstandardized approaches to the assessment of language behaviors. *American Speech and Hearing Association*, 20(5), 371-379.
- MILLER, J. (1981). *Assessing language production in children: Experimental procedures*. Baltimore, MD: University Park Press.
- MILLER, J. F., CHAPMAN, R. S., BRANSTON, M., & REICHEL, J. (1980). Comprehension development in sensorimotor stages 5 and 6. *Journal of Speech and Hearing Research*, 23, 284-311.
- MUMA, J. (1978). *Language handbook: Concepts, assessment, intervention*. Englewood Cliffs, NJ: Prentice-Hall.
- NEWBORG, J., STOCK, J., WNEK, L., GUIDUBALDI, J., & SVINICKI, J. (1984). *Batelle Developmental Inventory*. Allen, TX: DLM.
- OLSWANG, L., STOEL-GAMMON, C., COGGINS, T., & CARPENTER, R. (1987). *Assessing prelinguistic and early linguistic behaviors in developmentally young children*. Seattle, WA: University of Washington Press.
- P.L. 99-457. (1986). Education of the Handicapped Act Amendments of 1986, Title I, Handicapped Infants and Toddlers, Washington, DC, House Congressional Records.
- RETFERFORD, K., SCHWARTZ, B., & CHAPMAN, R. (1981). Semantic roles and residual grammatical categories in mother and child speech: Who tunes into whom? *Journal of Child Language*, 8, 583-608.
- ROBERTS, J., & CRAIS, E. (1989). Assessing communication skills. In D. Bailey & M. Wolery (Eds.), *Assessing infants and preschoolers with handicaps* (pp. 339-389). Columbus, OH: Charles E. Merrill.
- ROTH, F., & SPEKMAN, N. (1984). Assessing the pragmatic abilities of children: Part I. Organizational framework and assessment parameters. *Journal of Speech and Hearing Disorders*, 49, 2-11.
- SEIBERT, J., & HOGAN, A. (1982). A model for assessing social and object skills and planning intervention. In D. McClowry, A. Guildford, & S. Richardson (Eds.), *Infant communication, development, assessment, and intervention*, (pp. 21-53). New York: Grune & Stratton.
- SNYDER-MCLEAN, L., SACK, S., & SOLOMONSON, B. (1985). *Genetic Skills Inventory, Parsons Preschool Curriculum*. Parsons, KS: University of Kansas, Bureau of Child Research.
- WESTBY, C. (1980). Assessment of cognitive and language abilities through play. *Language, Speech, and Hearing Services in Schools*, 11, 154-168.
- WETHERBY, A. M., & PRIZANT, B. (1990). *Communication and Symbolic Behavior Scales*, Research Edition. San Antonio, TX: Special Press.
- YODER, D., & KENT, R. (1988). *Decision making in speech-language pathology*. Philadelphia, PA: B.C. Decker Inc.

Received January 3, 1989

Accepted March 12, 1990

Requests for reprints may be sent to: Elizabeth Crais, Division of Speech & Hearing Sciences, CB 7190 Wing D Medical School, University of North Carolina, Chapel Hill, NC 27599.



Go to Figure 2 Social Interaction

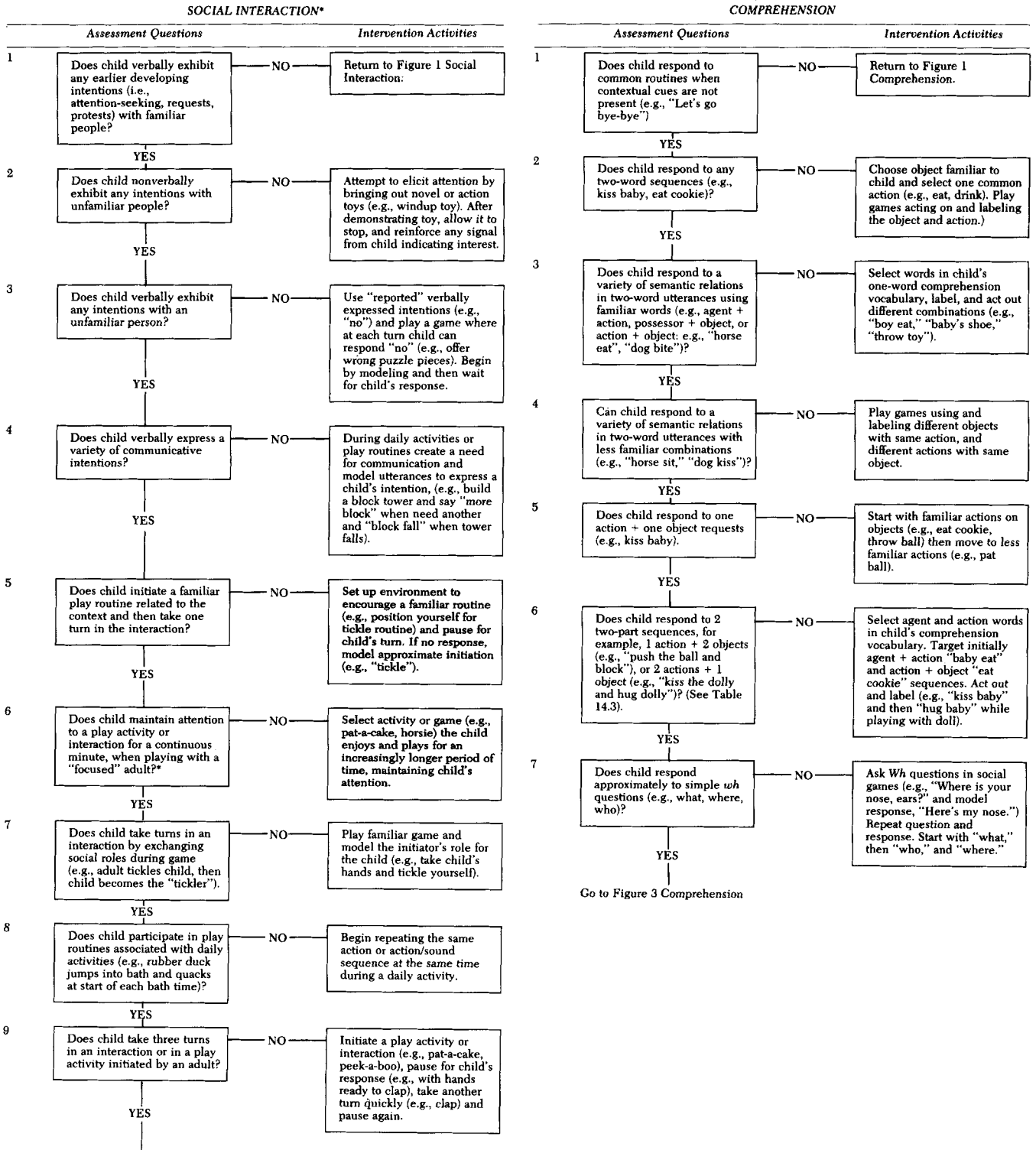
Go to Figure 2 Comprehension

*Figures 1-3 were adapted from Roberts & Crais (1989).

FIGURE 1. Decision tree for child at the prelinguistic stage.



FIGURE 1. (cont.).



*As the child's communicative skills improve, these turn-taking behaviors should first be seen vocally and later verbally.

FIGURE 2. Decision tree for child at the one-word utterance stage.

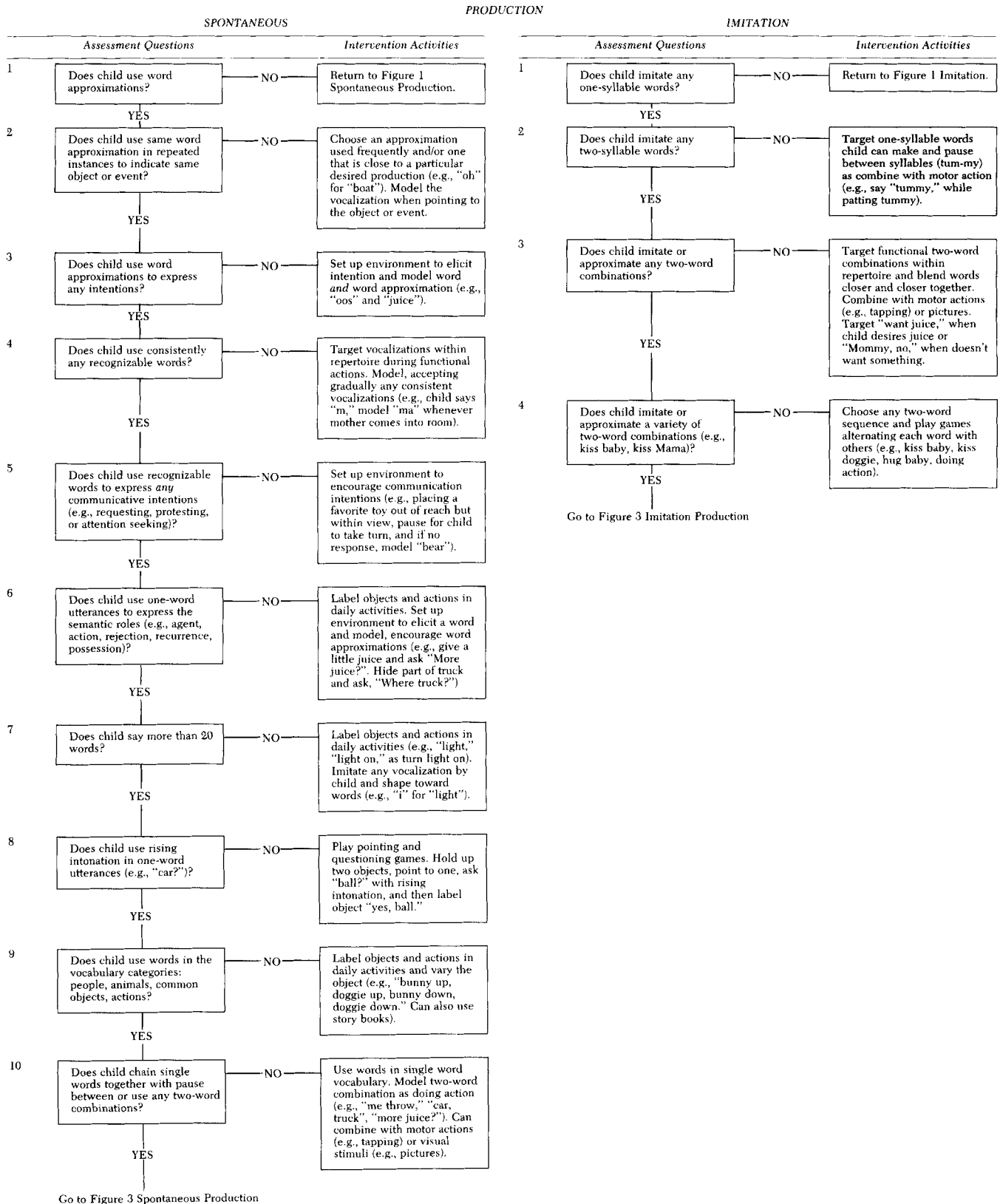


FIGURE 2. (cont.).

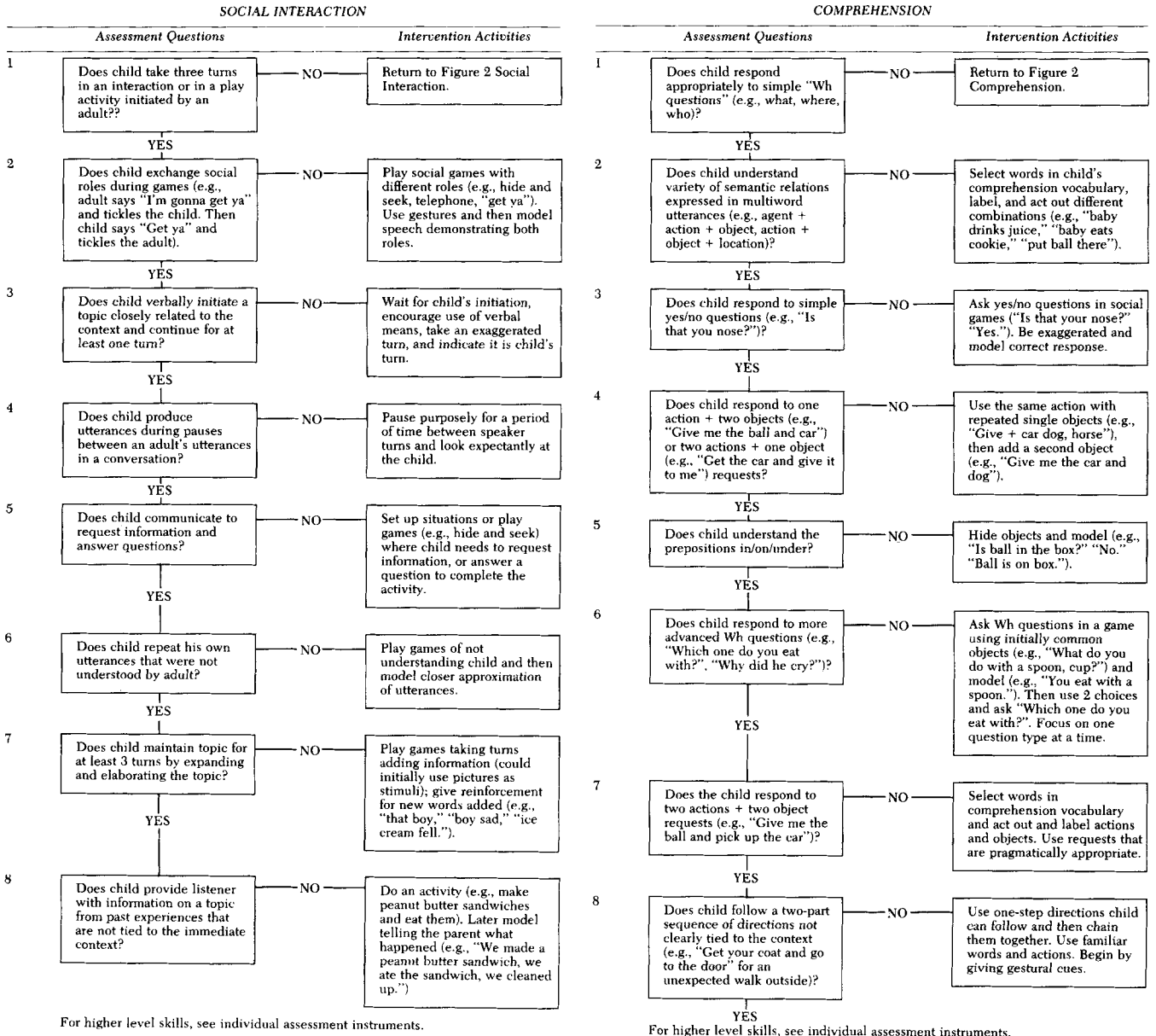
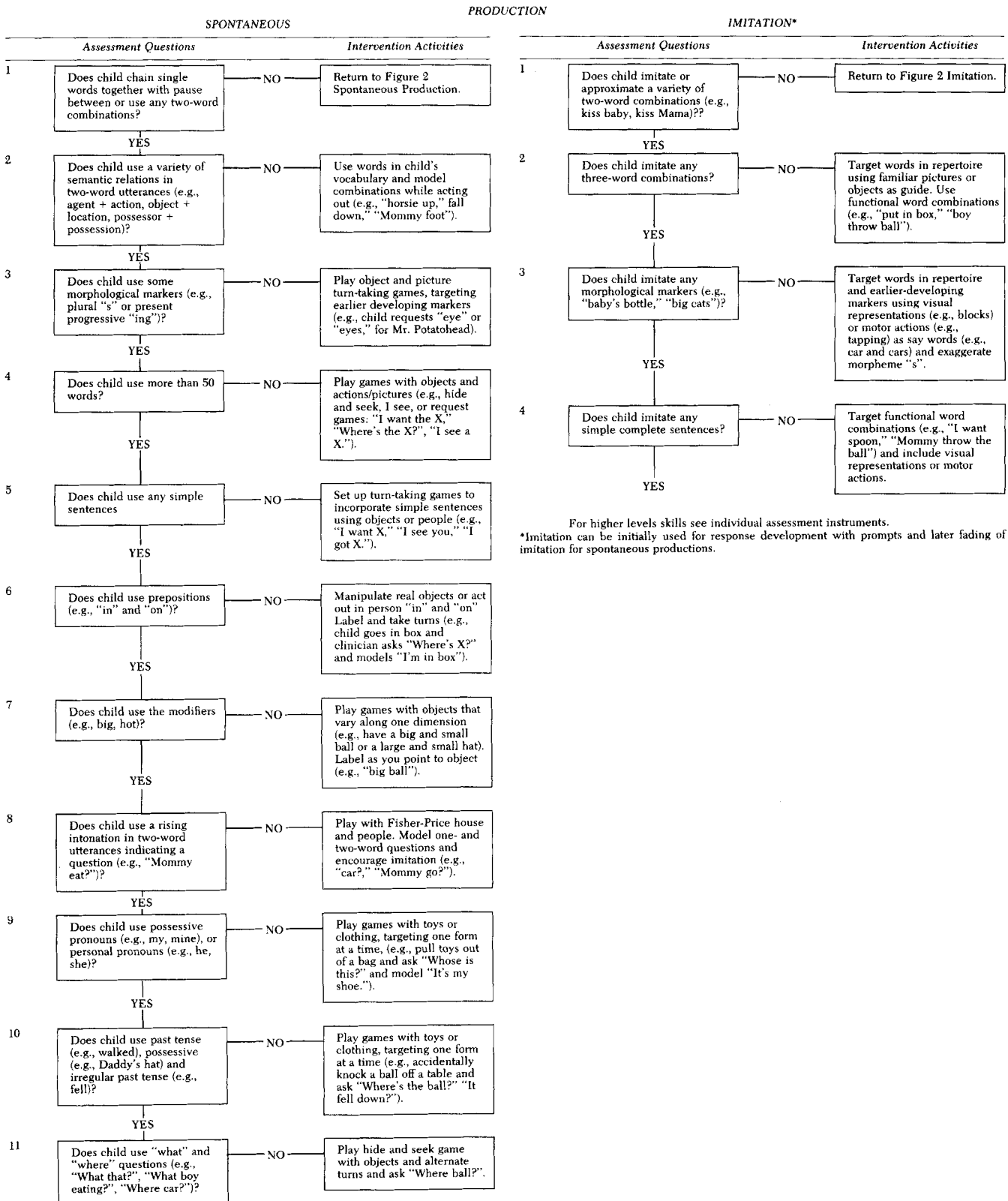


FIGURE 3. Decision tree for child at the two-word utterance stage and above.



For higher levels skills see individual assessment instruments.
 *Imitation can be initially used for response development with prompts and later fading of imitation for spontaneous productions.

FIGURE 3. (cont.).