5
Toward a Theory of Music Syntax: Some Observations of Music Babble in Young Children

JOHN M. HOLAHAN

The idea that music is a language is neither new nor correct. The expression "music is the universal language" is often used to convey the fact that speakers of different languages may be members of a common music culture. Unfortunately, some musicians have taken the expression more literally to mean either that music is a language, or that music may be explained by principles of linguistics (Bernstein, 1976). Some scholars have attempted to explain music by "borrowing" principles from linguistics in conjunction with traditional music theory (Lerdahl & Jackendoff, 1983). Relatively little progress has been made with those proposed explanations. Nonetheless, the fact remains that language and music do share common characteristics. Because both language and music are experienced fundamentally as patterns of sound arranged in time, it seems reasonable to suggest that the cognitive capacity for language and the cognitive capacity for music are analogous, but not homologous, processes. That is, although language and music share similar sensory and motor systems in the human body, there is no substantive evidence to suggest that the two cognitive capacities stem from common biological, genetic, or evolutionary origins. At a sufficiently abstract level of analysis, however, it may be possible to derive fundamental analogies between the cognitive capacity for language and the cognitive capacity for music.

Throughout history, philosophers, linguists, and psychologists have developed theories of the nature of language and language acquisition. Both mechanistic (empiricist) and organismic (rationalist) theories have been created. In the latter half of the 20th century, Chomsky's rationalist theory of language, transformational-generative grammar, has given new direction to the understanding of language and language acquisition (Chomsky, 1957, 1965, 1975, 1979, 1980). Chomsky asserted that an adequate grammar of a language must determine the properties of each sentence of that language. The grammar must explain the orderly arrangement, the phonetic form or sound pattern, and the meaning of the words in a sentence. Those three aspects of a sentence are formally accounted for by the syntax, phonology, and semantics of the language.

The syntactic component of the grammar consists of a finite set of rules that define how words are combined into sentences. The phonological component of the grammar is a set of rules that define how syntactic elements are pronounced in speech. The semantic component of the grammar provides information about the meaning of sentences generated by the grammar. Taken together, those three components serve as a theoretical model of how the mind is capable of listening to (receptive) and speaking (productive) language. An interesting property of an adequate grammar is that it can account for the infinite variety inherent in a language with a finite and relatively small set of linguistic rules. A second important aspect of a linguistic grammar is that the rules and representations defined by the grammar reveal principles of language that are apart from the conscious knowledge of a speaker of the language.

Chomsky used the metaphor that language is a "mental organ" that grows in the mind of every human being. As such, the language faculty is partly genetically determined and partly environmentally determined. The genetic component of language consists of a set of principles of organization that exist in all human languages. Taken together, that set of principles constitutes a universal grammar. All human beings, regardless of their native language, are endowed with a universal grammar for language. From birth, young children are given exposure to their native language. Although much of that exposure consists of incomplete or imperfect excerpts of language, children demonstrate through speech and comprehension that they possess the majority of the rules of their native language before the age of 5. Given the imperfections in the language-learning environment, Chomsky believes that it is impossible, in principle, for traditional empiricist models of learning to explain how children are capable of mastering their native language.

Current research in psycholinguistics is being undertaken to create a formal explanatory theory of how the young child makes the transition from "language babbler" in infancy to knowledgeable and self-directed language user before the age of 5. It is generally accepted that a description of the development of the child's grammatical knowledge is an important component of an adequate theory of language development.

Philosophers and psychologists have developed theories of the nature of music. Historically, the psychology of music may be traced back to the origins of experimental psychology in the latter half of the 19th century. Carl E. Seashore became the dominant music psychologist during the first half of the 20th century. Since the turn of the century, the psychology of music has been a multidisciplinary subject matter. Much of the experimental research in the psychology of music and music education has been devoted to the measurement of students' potential to learn music (music aptitude) and their attainment of music learning (music achievement). Other research traditions in the psychology of music have been devoted to laboratory experiments in psychoacoustics, cognitive psychology, and neurophysiology. The majority of research in the psychology of music and music education has been based upon the mechanistic principles of empiri-

cism. Gordon's research (1965, 1979, 1984) seems to be most closely associated with a rat ist or organismic viewpoint. (For a summary of current and past research perspectives in the psychology of music, see Hodges, 1980, and Shuter-Dyson & Gabriel, 1981.)

It is reasonable to assume, by analogy, that an adequate theory of music must explain the orderly arrangement of tonal and rhythm elements in music (syntax), and the sound pattern of individual tonal patterns and rhythm patterns in music (phonetic form). There are no music elements that are analogous to semantic meaning in language. Music syntax must explain the mental construction of music as a continuous experience over time (diachronically), whereas music phonology must explain the mental construction of discrete music elements from one to tone or note to note in time (synchronically).

Although music is characterized by the orderly arrangement of patterns of tones and rhythms, those tonal patterns and rhythm patterns are not related to lexical categories in language, such as noun or verb. Nonetheless, tonal patterns and rhythm patterns are organized by the musical mind into musical categories such as tonalities and meters. There is consensus among psychomusicologists that "auditory imagery," "inner hearing," or "audiation" is a fundamental process of music cognition. "Audiation takes place when one hears music through recall or creativity, the sound not being physically present except when one is engaging in performance, and derives musical meaning" (Gordon, 1979, p. 7). Tonal syntax is embodied in the recognition that the pitch relationships among the tones in a series of tonal patterns collectively suggest a tonality such as major, minor, dorian, and so on. Rhythm syntax is embodied in the recognition that the relationships among the durations and accents in a series of rhythm patterns collectively suggest a meter such as duple, triple, and so on. When one audiates music with tonal and rhythm syntax, one is said to possess a sense of tonality and a sense of meter (Gordon, 1984). Like the speaker's knowledge of the "rules of grammar," a sense of tonality and a sense of meter are not part of the child's conscious knowledge of music. A formal theory of tonal syntax and rhythm syntax should explain what a person knows when he or she demonstrates a sense of tonality and a sense of meter. Such a formal description should make explicit the mental structures that give rise to the recognition of tonality or meter.

Music syntax, like language grammar, enables the child to comprehend familiar and unfamiliar music aurally, and to reproduce familiar music and to create novel music orally. In the psychology of music, or psychomusicology, there is relatively little research that bears on the preschool child's acquisition of music syntax from infancy to age 5. The preschool child's music behavior has been characterized as being "music babble" (Gordon, 1984; Moog, 1976; Moorhead & Pond, 1977; Shuter-Dyson & Gabriel, 1981). A formal explanatory theory of how the young child makes the transition from "music babbler" to self-directed music maker, in terms of a theory of music syntax, is not available. Perhaps this is because the child's music development is slow when compared to his or her language development. Nonetheless, it seems reasonable to suggest that a theory of music syntax is an important component of an ade e theory of music development.

The purpose of the research reported here is to gain insight into the nature of music syntax as it develops in young children.

Method

Sample

Two samples of preschool-age children were observed. One sample consisted of 125 five-month-old to 5-year-old children, in five homogeneous age groups, who were enrolled in the Temple University Day Care Center. The children represented diverse ethnic and socioeconomic groups living in metropolitan Philadelphia. The children in each age group were provided informal music activities and were observed in two 30-minute sessions each week for 4 months. Observations were obtained from large group interactions among the children 3 years of age and older, and small group and individual interactions with the children younger than 3 years old.

The second sample consisted of 25 predominantly white, middle-class, 3- to 5-year-old children who were enrolled in a parent cooperative nursery school in Lancaster, Pennsylvania. The children were provided informal music activities on 1 day each week for 2 academic years. The author participated in the children's play, work, and mealtime activities throughout the day, thus providing many opportunities to observe their music behaviors in large group, small group, and individual interaction.

Cross-sectional observations reported here were obtained from infants and children younger than 3 years old in the first sample and longitudinal observations were obtained from children 3 to 5 years old in the second sample. Observations were recorded in notebooks, and on some occasions, on audiotape recordings. The reported observations are representative of typical musical behaviors of the respective samples.

Informal Instruction

The children in the longitudinal and cross-sectional groups were provided informal exposure to music by the author. The exposure consisted of singing songs in major, minor, mixolydian, dorian, lydian, and phrygian tonalities, with and without harmonic accompaniment on a guitar or an autoharp. The children were given opportunities to sing familiar songs of their own choosing, and to create songs, if they so desired. The children were also encouraged to move to music, using large and small muscles. The song materials included duple, triple, and unusual paired meters. Unusual paired meter occurs, for example, in music written with a 5/8 measure signature in which the metrical structure is 3 + 2 or

2 + 3. The children were given opportunities to move to music in rhythmic responses suggested by the author and in movements of their own choosing.

The music activities were informal for the following reasons. First, songs and activities were not taught with a rote procedure. Children were free to listen to and participate in activities without restrictions or demands imposed by the author. Second, no attempt was made to "teach" specific musical or nonmusical concepts such as pitch matching, "beat," "high" and "low," "loud" and "soft," and "steps" and "skips," which are examples of formal music instruction and theoretical understanding. Third, the children were encouraged to respond to the music activities, but they were never told that a specific response was inadequate or incorrect. Fourth, recorded music and music instruments were never used as substitutes for use of the human voice and body in music activities.

Observations

The introduction of informal music activities provided a relatively unfamiliar form of multidimensional stimulation for the children in both groups. Listening to, singing, or moving to music as simple as a rote song is, in itself, a multidimensional experience. The complex whole of a rote song includes tonal elements, rhythm elements, a linguistic text, and in some cases, physical actions, such as the motions that accompany "The Wheels on the Bus." The child consciously or unconsciously may attend to parts of any one dimension, or combination of dimensions at any time. For many children, the song text seemed to dominate their conscious awareness. On some occasions, however, a given child demonstrated awareness of tonal or rhythm elements, usually a pattern of one to three tones, or a brief rhythm pattern.

First Spontaneous Performances

From the beginning of instruction, the infants and young children in the cross-sectional group engaged in one-to-one interactions with the author. Two 9-month-old infants often babble-sang discrete pitches in response to rote songs. When songs were being sung in the key of D major and minor, one of those infants repeatedly babble-sang A above middle C; when songs were being sung in the key of G major and minor, she babble-sang G above middle C. Although the pitches she sang were part of the ongoing musical stimulus, it cannot be inferred that the child's pitch sense included the syntactic relation that is sometimes referred to as a sense of tonic, however, that she attended to one pitch is indicative of a sense of pitch center.

The infants and young children in the cross-sectional group engaged in all types of movement responses to music. One 11-month-old boy was particularly fond of swaying to music while standing in a secluded corner of the room. With his hands and feet outstretched at his sides, he swayed from side to side, using the walls to support his weight. His swaying was not synchronized with the tempo of the music, however; he swayed only when music was being performed. Whenever the music stopped, he peered from around the corner in anticipation of moving to more music.

Many children in the longitudinal group participated in one-to-one interactions with the author. In those first interactions, a given child sang familiar songs that had recently been sung to him or her, but on some occasions, he or she created a novel song. A spontaneous performance of a rote or created song usually consisted of one or two phrases. Rarely did a child sing a rote song in its entirety, unless the author was asked to sing along. The tonal aspects of those spontaneous performances only vaguely resembled the tonal characteristics of the songs to which the children had been introduced. One pitch, if any, was consistent throughout a performance. Different children sang the same rote song in different ways, but any one child tended to sing the same song using similar tonal patterns from one performance to the next.

When engaged in spontaneous performance, most children seemed to be self-absorbed, if not self-conscious. On some occasions, however, a given child could be observed singing spontaneously, seemingly without self-awareness.

The children in the longitudinal group also engaged in all types of movement responses to music. They walked, ran, jumped, hopped, clapped, rocked, and swayed in response to music. As a group, there was no consensus demonstrated in the characteristics of their movement. Although the children moved seemingly without self-awareness or reservation, there seemed to be little relationship between the subjective characteristics of their movement and the objective rhythmic characteristics of the music to which they moved.

More Advanced Performances

As music became more familiar to the children, their musical performances became more advanced. In the cross-sectional group, the 9-month-old girl who babble-sang to music from the beginning of informal instruction continued to do so. Her musical babble-singing was extended to include singing individual pitches and pitch patterns without music being present physically. Her parents reported that "singing" and "dancing" became part of her daily activities. The emergence of child-directed music making suggests the presence of the capacity to "generate" music and not merely to imitate music. Likewise, a 15-month-old boy increased his active participation in music making; however, he sang only in conjunction with a musical stimulus. He frequently sang the song "Up and Down" (Figure 5.1).

He evidently sang along with only those parts of the song that he could approximate in speech. It is also interesting to note that each portion that he sang, with the exception of the last pitch, consisted of the same three-tone pattern of disjunct diatonic intervals in the same melodic rhythm. All portions that he sang included the tonic tone (G). It is interesting to note that the child's capacity to render both a consistent tonal pattern and a consistent tonic tone suggest the presence of at least a syntactic sense of tonic, if not a syntactic sense of tonality.

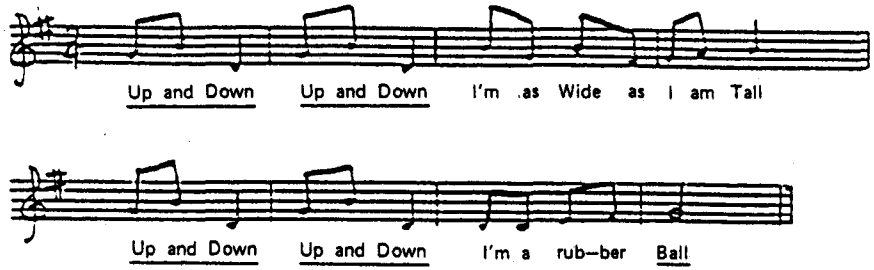


FIGURE 5.1. Response of a 15-month-old boy in the cross-sectional group to the song "Up and Down." Underlined portions were babble-sung by the boy as he listened to the song in its entirety. (Song composed by Doug Nichol.)

A 2½-year-old boy often spontaneously sang the song "Bingo." Contrary to the previous examples, he sang the song in its entirety, although the "words" and "music" of his performance could barely be recognized as being the song "Bingo." That this child's rendition of "Bingo" did not have recognizable tonal syntactic properties suggests that his memory for the song did not include a representation of the abstract syntactic characteristics of the melody.

The children in the longitudinal group also demonstrated more advanced levels of performance achievement. A 3½-year-old girl was observed to be walking and chanting the chant in Figure 5.2 in a consistent tempo. Her mother indicated that the girl had learned to chant that rhythm by being exposed informally to her older sister's Suzuki piano lessons. Although she repeated that pattern many times with precision, she was reluctant to chant other rhythm patterns or the same rhythm pattern with another text. Although this child was clearly capable of reproducing the rhythm pattern (the phonology of the rhythm pattern), she did not demonstrate a sense of meter for other patterns in duple meter.

On another occasion, a 4-year-old boy became interested in echo-clapping rhythms with the author. Among the duple meter patterns that he echo-clapped were the pair of patterns shown in Figure 5.3, which comprise the song "Up and Down" (notated in Figure 5.1). Although he could clap the individual patterns quite consistently, the boy could not clap the melodic rhythm of the song "Up and Down" consistently with the author. Again, the boy demonstrated a phonological understanding of the rhythm pattern in isolation (synchronically), but he was unable to comprehend the structure of duple meter over time (diachronically).

A 5-year-old girl spontaneously sang the first two phrases of a song to which she only recently had been introduced. The tonal patterns that comprise the two

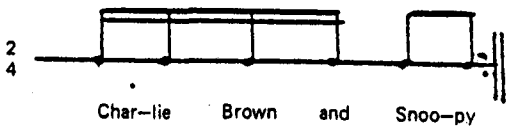
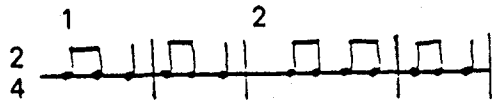


FIGURE 5.2. Chant of a 3.5-year-old girl in the longitudinal group.

FIGURE 5.3. Echo-clapping patterns of a 4-year-old boy comprising the song "Up and Down."



phrases of the song as they had been sung to the children (1) and as she sang them (2) are shown in Figure 5.4. The two renditions of the two phrases have the same melodic contour, but not the same interval content. Although not all of the note-to-note relationships are preserved in the spontaneous performance, it is perhaps most important that both renditions begin and end on the same pitch. In this case the child is demonstrating syntactic knowledge of pitch over a fairly wide (diachronic) time interval.

Creative Music Responses

Many children in both the cross-sectional and longitudinal groups created novel songs. In general, their creative acts were one of two types. The first, and most frequent, creations were modifications of familiar songs. In those creations the child improvised a song based on the melody, rhythm, and text of the familiar song. The second type of creative performances consisted of story-like or conversational texts, sung or intoned with brief melodic formulas in a free rhythmic structure.

A 5-year-old girl in the longitudinal group often created songs of the second type. On one occasion she created a song based on "The Three Bears" story. She was able to recreate that improvisation a second time, more than 2 hours after the first. Many melodic and rhythmic details of the two performances were similar, if not identical. It is unlikely that a theory of musical memory could account for the similarities in the two performances without including a syntactical representation of the musical information in the performances.

A 4-year-old girl became interested in echo-singing tonal patterns with the author while playing outdoors one day. After echoing four or five patterns on a neutral syllable, the patterns shown in Figure 5.5 were performed. She echoed the first pattern confidently, without self-awareness. When pattern 3 was performed by the author, the girl turned away, as if withdrawing from the dialogue, then she responded with pattern 4. Immediately after the performance, she ran

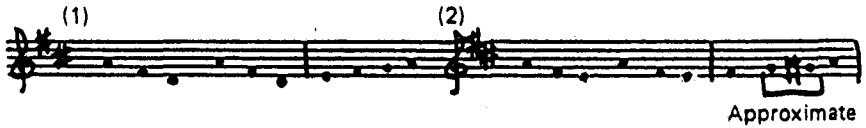


FIGURE 5.4. Tonal patterns of a song (1) as sung to a 5-year-old girl in the longitudinal group and (2) as she sang them.

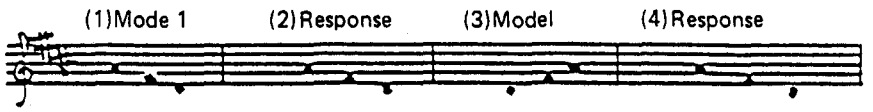


FIGURE 5.5. Echo-singing of tonal patterns by a 4-year-old girl in the longitudinal group and the author.

off and did not respond to any other tonal patterns sung by the author. She apparently was not upset, but somewhat bewildered by what she had performed. This child's creative performance is most interesting because it is limited to isolated (synchronic) tonal patterns. Although it is apparent that she possesses a phonological understanding of the first tonal pattern, she is also capable of restructuring that pattern in a novel way. Thus it is possible to suggest that young children are capable of creating at a level similar to their phonological or syntactic understanding.

Interpretation

It seems reasonable to suggest that three qualitatively different levels of music babble may be identified in the foregoing observations. At the first level of babble, the children perform discrete music elements—a pitch, a tonal pattern, a movement, or a rhythm pattern synchronically in conjunction with an external musical stimulus. Children in this level of development typically do not perform apart from musical stimulation.

At the second level of music babble, children perform combinations of discrete music elements arranged synchronically, but those discrete elements do not give rise to tonal or rhythmic organization. To the adult, those performances lack tonal and rhythm syntax. Children in the second level of music babble are capable of spontaneous performance of music apart from a musical stimulus. The emergence of spontaneous performance can be interpreted as being an objective indication that children are capable of representing musical sounds mentally—the children are beginning to audiate apart from concurrent perception of an external musical stimulus. The quality and quantity of preschool children's spontaneous musical performances may be the best predictor of their concurrent rote singing achievement and their later developmental music aptitude in kindergarten (see Gordon, 1979; Levinowitz, 1985).

At the third level of music babble, children's spontaneous performances become more coherent. Spontaneous performances of familiar songs resemble, but are not identical to, the characteristics of the songs as they had been sung to the children. Children in the third level of music babble also are capable of creating and improvising music apart from concurrent musical stimulation. Spontaneous and creative performances take on tonal and rhythmic syntax, as evidenced by a recurring pitch center and a consistent tempo. Organization of this type

exists "across time" diachronically. Tonal and rhythm music syntax begins with the emergence of diachronic organization. When children at the third level of babble listen to or perform music, they are beginning to become aware of relationships among the sounds of the music that have occurred in the immediate past, and are occurring in the present. Young children's music syntax originates in the second and third levels of music babble and becomes more sophisticated through formal music instruction throughout the school years (Gordon, 1984).

That the development of music syntax is more than a function of memory is demonstrated by the organization of children's creative music responses. Although they are novel, and therefore not memorized, these creative responses are only as coherent as the children's rote singing and spontaneous performances. Moreover, because children can create music, it seems reasonable to suggest that music syntax, like language syntax, is a generative capacity.

Conclusions and Implications

There is little doubt that children learn a great deal from informal exposure to, and spontaneous performance of, music. The same can be said of children's exposure to, and spontaneous performance of, language. Chomsky (1975) observed that children's acquisition of linguistic competence is based on extremely little exposure to the "data" of language. One can only speculate about what the young child could learn if he or she were exposed to the "data" of music one half as much as he or she exposed to the "data" of language.

The emergence of the mental representation of musical sounds by young children tends to suggest that, like language, music can be considered to be a "mental organ" that may be studied in the organismic tradition of Chomsky's theoretical linguistics. A formal theory of the human cognitive capacity for music would have far-reaching implications for the cognitive psychology of music and for music education. For example, with an adequate theoretical foundation, it may be possible to explain how the young child represents songs mentally. If Chomsky's rational theory of language is correct, it seems reasonable to suggest that the task of learning the tonal, rhythmic, and linguistic information in a simple rote song cannot be explained easily, and possibly at all, by empiricist theories of learning. Moreover, the belief that laboratory studies of music cognition can explain how children acquire music understanding, or can lead to a valid theory of musical knowledge is increasingly suspect.

For music education, it seems reasonable to suggest that the practice of beginning to expose children to music only when they arrive at kindergarten also is increasingly suspect. The fact that preschool children can profit from informal music instruction may provide impetus for additional research investigations that bear on how and what the preschool child learns by listening to, and performing music. Effective informal exposure to music will be crucial for the future musical development of young children.

Acknowledgments. The observations reported here were made during the years 1980–1982 while the author was a Russell Conwell University Fellow at Temple University. The author wishes to express thanks to the staff, parents, and children of the Temple University Day Care Center for making their contribution to this research. The author also wishes to express thanks to the staff, parents, and children of the Unitarian Cooperative Nursery School for making this research possible.

References

Bernstein, L. (1976). *The unanswered question*. Cambridge, MA: Harvard University Press.

Chomsky, N. (1957). *Syntactic structures*. The Hague: Mouton.

Chomsky, N. (1965). *Aspects of the theory of syntax*. Cambridge, MA: M.I.T. Press.

Chomsky, N. (1975). *Reflections on language*. New York: Pantheon.

Chomsky, N. (1979). *Language and responsibility*. New York: Pantheon.

Chomsky, N. (1980). *Rules and representations*. New York: Columbia University Press.

Gordon, E. (1965). *Musical aptitude profile*. Boston: Houghton Mifflin.

Gordon, E. E. (1979). *Primary measures of music audiation*. Chicago: G.I.A. Publications.

Gordon, E. E. (1984). *Learning sequences in music: Skill, content, and patterns. A music learning theory*. Chicago: G.I.A. Publications.

Hodges, D. A. (Ed.). (1980). *Handbook of music psychology*. Lawrence, KS: National Association of Music Therapy.

Lerdahl, F., & Jackendoff, R. (1983). *A generative theory of tonal music*. Cambridge, MA: M.I.T. Press.

Levinowitz, L. M. (1985). *The comparative effects of two types of song instruction on the development of a sense of tonality in four-year old children*. Unpublished master's thesis, Temple University, Philadelphia, PA.

Moog, H. (1976). *The musical experience of the pre-school child* (C. Clark, trans.). London: Schott.

Moorhead, G. E., & Pond, D. (1978). *Music of young children*. Santa Barbara, CA: Pillsbury Foundation for the Advancement of Music Education.

Shuter-Dyson, R., & Gabriel, C. (1981). *The psychology of musical ability* (2nd ed.). London: Methuen.