The present study was designed to assess novice teachers' perceptions of timing in music instruction and to identify the aspects of timing that are associated with positive perceptions of instructional pacing. We selected eight 1–3-minute excerpts from teaching-practicum videotapes of four novice teachers teaching in a choral rehearsal, a band rehearsal, and two elementary music classrooms. Each teacher appeared in two excerpts that differed with regard to the pace of instruction depicted in each. Novice teachers (N = 44) viewed the videotaped excerpts and evaluated the pace of instruction along six semantic differential scales: fast–slow; appropriate–inappropriate; tense–relaxed; smooth–uneven; too fast–too slow; good–bad. Subjects discriminated among the faster and slower examples on five of the six evaluation dimensions, and among teachers on all six dimensions. Subjects rated the pace of instruction more positively when the rates of student performance episodes and teacher activity episodes were higher rather than lower, and when the mean durations of teacher and student activity were shorter rather than longer. These variables may function as operational measures of the pace of instruction in music performance.

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Empirical Description of the Pace of Music Instruction

The prescriptive assessment of teaching presents vexing problems for researchers and practitioners alike. For those directly involved in the preparation of teachers, the development of precise and reliable assessment procedures, which may serve not only as a means of summative evaluation but also as diagnostic and prescriptive tools, is a major concern. At present, the process of assessment in teaching may comprise widely varied procedures, ranging from written assessment of knowledge of the field to observation instruments intended to record the behavior of the practitioner at work.

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Years of systematic investigation have resulted in the identification of important variables that seem particularly germane to successful, productive changes in student behavior (Madsen & Duke, 1995); yet, the systematic assessment of specific variables that are associated with effective teaching seems no more reliable an indicator of effectiveness than are more global assessments in which observers simply rate the overall experience on a single scale of quality (Madsen, Standley, Byo, & Cassidy, 1992). Broadly framed definitions of effective teaching certainly have helped narrow the focus of observers’ attention, which has proven to be highly idiosyncratic (Duke, 1987; Duke & Blackman, 1991; Duke & Prickett, 1987; Madsen & Duke, 1985a, 1985b; Prickett & Duke, 1992; Standley & Greenfield, 1987), but the precise identification of the critical attributes of effective practice seems more elusive. Although the relative reliability and stability of global evaluations may adequately serve the purpose of identifying exceptionally high- and low-quality performance among practitioners, there remains the problem of accurately describing the essential qualities of exemplary teacher behavior, both for the purpose of better understanding the instructional process and for the purpose of providing more meaningful prescriptions for the improvement of practice among novices and professionals in need of remediation.

Methods of systematic observation applied in music research and elsewhere include (1) a wide variety of time-sampling observation instruments designed to record specific aspects of teacher and student behavior and instructional progress (Duke & Madsen, 1991; Madsen & Madsen, 1974; Madsen & Yarbrough, 1980), (2) written typescripts of verbalizations that include event timing and behavior categorization in terms of sequential patterns of instruction (Byo, 1994; Jellison & Wolfe, 1987; Price, 1983; Yarbrough & Price, 1981, 1989), (3) coded analyses of scripted curricula in which teacher and student behaviors are categorized in terms of “learn units” (Greer, McCorkle, & Williams, 1989; Ingham & Greer, 1992), (4) calculation of timing and event probabilities associated with patterns of teacher and student behavior (Hawkins, Sharpe, & Ray, 1994), and (5) computerized recording of teacher and student behavior and the timing of progress toward instructional goals (Buckner, 1997; Duke, 1991; Siebenaler, 1997; Younger-Flores, 1995). Still other researchers have approached the observation and analysis of teaching and conducting from what is perhaps the broadest perspective possible, considering overall, or global, evaluations of effective teaching and rehearsing (Byo, 1990; Cassidy, 1990; Madsen & Geringer, 1989; Madsen, Standley, Byo, & Cassidy, 1992).

The body of research literature devoted to instructional feedback is expansive, as is the research base concerning issues related to instructional presentation (e.g., curriculum, sequence of instruction). Likewise, the planning and implementation of instruction and the delivery of feedback are prominent components of teacher education curricula. Less attention has been directed toward the timing of instructional variables, however, although timing is central to nearly all aspects of human interaction. The perception of humor and artistic

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expression, the effects of primacy and recency on the salience of memories, and the effects of differential feedback and reinforcement schedules on operant behavior are a few of the common experiences that exemplify the primary nature of the timing of events (Bower & Hilgard, 1981), but the list of human behaviors that are affected by timing is virtually limitless. Often, when things happen is as important as what happens (Madsen, 1996).

Systematic measurement of temporal relationships among various aspects of human and other animal behavior has revealed reliable principles of learning and behavior that have predictive as well as explanatory implications. To speak of relationships between conditioned and unconditioned stimuli, or between reinforcement, punishment, and operant behavior, without considering the timing of events, is to ignore what is perhaps the most basic mechanism in the learning process. Most systematic measurements of individual aspects of teaching performance (e.g., questions, feedback), however, are expressed in terms of frequency or proportion; less often are rate and mean duration included as explicit components of measurement (Yarbrough, 1988).

The issue of instructional timing, or "pacing," has been the focus of educational research in disciplines other than music (Good, Grouws, & Beckerman, 1978), but definitions of pacing vary widely. Brophy (1979), for example, defined pace as the "speed with which students move through the material to be learned" (p. 736), and a number of investigations have examined pacing as the rate of presentation (Barr, 1973–1974; Brophy, 1986; Campbell & Allen, 1988). Preece (1990) posited a lawful relationship between the rate at which new material is presented, student ability, and the amount learned per lesson, and developed a compelling set of algebraic models that describe instructional pacing in relation to student understanding and acquisition of skills.

In other research, pacing has been assessed in terms of the speed of the teacher's verbalizations (Chilcoat, 1987; Grobe & Pettibone, 1975), the timing of student assessments (Roberts, 1989), contingencies for meeting course deadlines (Ross & McBean, 1995), and the rates at which teachers change activities (Dahlöf, 1971; Lundgren, 1972). Pace as a combination of teacher presentation rate and student response frequency has been studied in a variety of settings (Brophy & Good, 1986; Darch & Gersten, 1985; Englert, 1984), in all of which "rapid pacing" was associated with greater student attentiveness and higher student achievement. Even the positive effects (with regard to knowledge acquisition) of humor in instructional presentations have been shown to increase with faster pacing of humorous episodes (Wakshlag, Day, & Zillmann, 1981; Zillmann, Williams, Bryant, Boynton, & Wolf, 1980).

Unlike most academic classroom instruction, during which students, for the most part, respond either individually or not at all during the course of an instructional presentation, music performance instruction necessarily involves the active, overt participation of all students throughout the learning process. The very nature of music instruction embodies an ongoing alternation between teacher instructions and stu-
dent performance trials, and this alternation of teacher and student activity has been studied extensively in recent years (e.g., Goolsby, 1996; Hendel, 1995; Price & Yarbrough, 1991). Since instructional activity in music is somewhat atypical in the sense that students have frequent performance opportunities that demonstrate their levels of skill acquisition moment to moment, it seems logical that the nature of pacing in music instruction must encompass not only the behavior of the teacher, but also the instructional interactions between teachers and students.

Although the timing of various elements of instructional interactions has not been the primary focus of research in music, there are some important consistencies that have been observed among excellent music teachers. In detailed analyses of one-on-one piano instruction, for example, teachers identified as the most skilled, either through expert observers’ evaluations (Seibenaler, 1997) or through evaluations of student accomplishment (Buckner, 1997), consistently demonstrated more rapid alternations between teacher activity and student activity than was demonstrated by less-skilled teachers (Buckner, 1997; Seibenaler, 1997). Timing measurements of excellent teachers were characterized by higher rates of teacher verbalizations, especially directives and feedback, and correspondingly higher rates of student performance opportunities. Commensurate with these higher rates of behavior were briefer episodes of teacher behavior (e.g., talking, modeling) and student behavior (e.g., playing).

Interestingly, and perhaps contrary to conventional wisdom, the students of the more skilled teachers did not perform for a greater proportion of the total lesson time than did the students of the less skilled teachers; in fact, in both Buckner’s and Siebenaler’s investigations, the total proportions of time devoted to teacher and student activity were generally unrelated to the quality of instruction. The aspect of timing that most clearly differentiated the lessons of the more skilled and less skilled teachers was the mean duration of each activity episode (i.e., student performance or teacher verbalization) and the corresponding rates of alternation between teacher and student activities (Buckner, 1997; Siebenaler, 1997).

The present study was designed to assess observers’ perceptions of pacing in music instruction and to identify the aspects of timing that are associated with evaluations of instructional pacing. Although there exists a vast literature devoted to analyses of the teaching-learning process, there is surprisingly little attention given to the empirical analysis and description of pacing in teaching, especially in music, where pacing remains virtually unstudied. It seemed important that we begin the process of investigating this very complex aspect of music teaching using examples taken from actual classrooms and looking for behavioral correlates of subjects’ perceptions of various aspects of instructional pace. Specifically, we attempted to determine first whether observers could reliably differentiate between teaching excerpts that had been selected as examples of slower and faster pace. In addition, we sought to identify timing variables in instructional interactions that were related to subjects’ perceptions.
METHOD

We selected eight 1- to 3-minute excerpts from teaching practicum videotapes recorded by four novice teachers teaching in a variety of music settings: a choral rehearsal, a band rehearsal, and two elementary music classrooms. Each teacher appeared in two excerpts that differed with regard to the pace of instruction depicted in each. From a single class or rehearsal taught by each of the four teachers, we selected one excerpt that seemed to us to illustrate a slower pace and a second excerpt that seemed to illustrate a faster pace. The eight excerpts ranged in duration from 1 minute 22 seconds to 3 minutes 8 seconds; five of the eight examples lasted between 2 and 3 minutes. In all eight examples, the teacher and a portion of the students in the class or ensemble were in view of the camera. The voice of the teacher and the responses and performances by the students were clearly audible. We selected the excerpts for presentation based not only on the apparent pace depicted in each, but also because we believed that all eight examples illustrated what most observers would consider “good teaching.” In all eight excerpts, the teachers’ goals for the students in the class or ensemble were discernible, and the teachers made progress toward accomplishing these goals during the recorded excerpts.

Since the intent of this investigation was to identify the timing variables that are associated with observers’ perceptions of instructional pace, we created a timing profile of each of the eight examples, using computerized observation software designed explicitly for research of this type (Duke & Farra, 1996). In exploratory research of this nature, in which there are seemingly innumerable variables present in the stimulus, we wanted to control for as many extraneous variables as possible while focusing on differences in timing. To achieve this goal, we compared each of the four teachers’ slower and faster excerpts. Thus, the two excerpts in each pair show the same teacher on the same day working with the same students during the same class period on the same type of skills.

The behavior categories and timing measurements, of course, have everything to do with the interpretation of our data, so these aspects of this research are described in some detail here. We recorded timing data in several different ways. In previous investigations involving teacher observation, researchers have measured aspects of behavior in terms of the proportion of time intervals in an observation period during which a given behavior category appears (i.e., time-sampling), and this type of analysis has proved very useful across decades of systematic observation. Counting the frequencies of occurrences of given categories of behavior also has a long history in educational and behavioral research. We included both of these measurements in our analysis, and, in addition, we calculated the mean episode duration across all instances of a given behavior category—for example, the mean duration of student performance episodes across all instances of student performance in an observation period. Thus, our analyses of the timing of events in the excerpts we presented in this investigation include
(1) proportion of time—the total proportion of each lesson excerpt during which a given behavior is present; (2) mean episode duration—the mean duration across all instances of a given category of behavior; and (3) rate per minute—the number of instances of a given behavior category that occur each minute, averaged over the duration of the excerpt. We used proportions of time, expressed as percentages, rather than total time, expressed in minutes and seconds, and we used rates per minute rather than frequencies in order to facilitate comparisons between excerpts of different durations.

Novice teachers (N = 44) enrolled in junior- or senior-level courses in music teacher education programs at the University of Texas at Austin or the University of Alabama viewed the videotaped excerpts in groups of 4 to 12 on large television monitors and evaluated the pace of instruction along six 5-point semantic differential scales. Following the presentation of each excerpt, subjects evaluated the pace of instruction in terms of the following dimensions: fast-slow; appropriate-inappropriate; tense-relaxed; smooth-uneven; too fast-too slow; and good-bad.

We recorded two stimulus tapes, each of which contained one excerpt from each of the four teachers. To control for possible order effects, we arranged the presentations so that approximately half the subjects viewed Excerpts 1–4 (one excerpt of each teacher) followed by 5–8, and the remaining subjects viewed Excerpts 5–8 followed by 1–4. The pacing in the four excerpts on each tape alternated between fast and slow.

RESULTS

We began the analyses of subjects’ responses to the six semantic differential evaluations with univariate comparisons across the eight excerpts (3-way analyses of variance: Order of presentation [2] by Teacher [4] by Pace of Example [2]). Results of these analyses indicate that there were no differences attributable to the order of presentation (Excerpts 1–4 followed by Excerpts 5–8 or vice versa), F (1,42) < 1.9, p > .17, but subjects responded differentially among the four teachers on all six evaluation scales, F (3,126) > 6.3, p < .0005, and between the faster and slower videotaped examples on five of the six evaluation scales (all except tense–relaxed), F (1,42) > 16.8, p < .0001. As expected, in light of the complexity of the stimulus material, the differences among subjects’ responses to the faster and slower excerpts in each pair are not consistent across teachers, F (3,126) > 4.7, p < .004. Although the faster example in each excerpt pair was rated more positively than the slower example overall, the differences between examples in each pair varied in magnitude among the four teachers. Subjects’ mean responses, averaged across the four slower and four faster examples are shown in Figure 1. Not only did subjects rate the faster examples more positively than they rated the slower examples, but, as indicated by the standard error bars in Figure 1, there was considerably less variation (across examples) in subjects’ ratings of the faster examples compared
Figure 1. Subjects' mean ratings across the four faster examples (○) and the four slower examples (●). Vertical lines indicate Standard Error (SE). SEs for the faster example means are shown to the right of each mean; SEs for the slower example means are shown to the left of each mean.
to their ratings of the slower examples.

These data indicate quite clearly that the novice teachers in our sample were able to discriminate between examples of faster and slower instructional pace. Although the responses in each pair of excerpts differed among excerpt pairs (i.e., among teachers), subjects consistently rated more positively the excerpt that we had identified as the faster example in each pair. Recall that all of the examples depicted good teaching—students successfully accomplished the goals identified by the teacher in each example—and subjects were directed specifically to evaluate the pace of instruction, not the overall quality of teaching.

There were inherent, and anticipated, redundancies among the six semantic differential scales to which subjects responded. To explore this idea further, we subjected the entire evaluation data set, including subjects’ responses to all eight excerpts, to a principal components factor analysis, which revealed three distinct factors with no meaningful cross-loadings (factor loadings for the oblique solution reference structure are given in parentheses that follow each scale). The appropriate—inappropriate (.815), smooth—uneven (.653), and good—bad (.793) scales loaded on the first factor; the fast—slow (.729) and too fast—too slow (.923) scales loaded on the second factor; and the tense—relaxed (.910) scale loaded on a third factor. This seems an entirely reasonable factor solution. These three factors seem appropriately interpreted as representing three dimensions underlying the six scales: quality, speed, and tension. These three factors account for 50% (quality), 24% (speed), and 11% (tension) of the variance in the model.

We had selected the videotaped examples based on our own perceptions of the relative pace depicted in each and not based on timing criteria that we had determined a priori. Wanting to use examples of “real teaching” rather than contrived or scripted vignettes, we simply looked for videotapes (1) that showed teachers successfully accomplishing musical goals with students and (2) that evidenced apparent differences with regard to pace. In order to summarize the timing characteristics of the faster and slower excerpts in the eight videotaped examples selected, we created a single, composite timing profile, which contrasts the median values of each timing variable averaged across the four slower excerpts and the four faster excerpts (see Figure 2). This comparison of the aggregated data from the four slower and four faster excerpts illustrates what seem to be some of the most important timing characteristics that differentiate slower- and faster-paced examples of teaching. The data for percentages of total time (top of Figure 2) and mean episode durations (middle of Figure 2) are expressed in the units of each measurement (i.e., percent and seconds). The rate per minute data (bottom of Figure 2) are expressed in \( n \) per minute multiplied by a factor of 10, in order to accommodate the unit values of percentage, duration, and rate on a single graph.

Contrary to what many would describe as conventional wisdom, the faster profile (right side of the figure) does not contain higher proportions of student activity and lower proportions of teacher activity than are present in the slower profile (left side of the figure). In fact,
Figure 2. Composite timing profile for the four slower videotaped examples (left) and the four faster examples (right). 

- **Talk** = verbalization by the teacher; 
- **Demo** = teacher demonstration or modeling; 
- **Full Grp** = full-group student activity (verbal or performance); 
- **Sm Grp** = small-group student activity (verbal or performance); 
- **Indiv** = individual student activity (verbal or performance); 
- **Info** = information statement by the teacher; 
- **Dir** = directive statement by the teacher; 
- ? = question by the teacher; 
- **Fb+** = positive verbal feedback by the teacher; 
- **Fb-** = negative verbal feedback by the teacher; 
- **Play/Sing** = student music performance; 
- **Approx** = student approximation of music performance (e.g., counting aloud; clapping the rhythm); 
- **Verbal** = verbalization by the student.
the opposite is true. As is shown in the top portion of Figure 2, there are relatively equal proportions of teacher activity and student activity in the slower examples and markedly higher proportions of teacher activity compared to student activity in the faster examples. However, the mean episode durations, shown in the middle portion of Figure 2, are shorter in the faster profiles for every measured variable (teacher talk, teacher demonstration, full-group student activity, and individual student activity). Commensurate with these shorter episode durations, there are higher rates per minute (shown in the bottom portion of Figure 2) of teacher talk and teacher demonstration, full-group student activity, and music performance (labeled Play/Sing). With regard to the content of teacher verbalizations, there are higher rates of directives and feedback, and lower rates of information statements and questions, in the faster profile compared to the slower profile.

In summary, across all four teachers, the excerpts that subjects rated more positively were characterized by higher rates of teacher talk and student performance, indicating a more rapid alternation between episodes of teacher and student activity. The faster examples in each pair also included briefer teacher-talk and student-performance episodes than appeared in the slower examples.

DISCUSSION

These data suggest that the rates of teacher talk episodes and student performance episodes—which capture the rate of alternation between teacher and student performance activity—are the salient variables that contribute to subjects' perceptions of the pace of instruction. In all four pairs of taped examples, the excerpts that were identified as having a faster pace included student performance opportunities (Play/Sing in Figure 2) at greater than twice the rate of performance opportunities in the slower examples. This is the most consistent difference across all measured timing variables. The data also indicate that higher rates of directives and lower rates of information statements are associated with faster perceived pace, and these higher rates of directives may be ancillary to the rate of performance opportunities in music settings.

The data from the examples used in this investigation suggest that the perceived pace of instruction in music is proportional to the rate of student performance opportunities, rather than to the overall percentage of class time devoted to student performance. The difference between these two measures of student performance time is not trivial. Of course, if students are to perform more frequently in a given time period, the mean duration of individual performance episodes and episodes of teacher activity must be shorter. This conceptualization of a fast-paced rehearsal or class—frequent, generally brief performance episodes, and brief episodes of teacher activity—is consistent with most conceptualizations about effective instruction. For example, "opportunity to respond" (Delquadri, Greenwood, Stretton, & Hall, 1983;
Greenwood, Hart, Walker, & Risley, 1994; Stanley & Greenwood, 1983) and “engaged time” (Coatney, 1985; Johnson & Butts, 1983; Leach & Ingram, 1989; Lewellen, 1990) have been identified consistently as important aspects of effective teaching across a number of disciplines, and, if students perform more frequently and for shorter durations overall, then there are more opportunities for teachers to provide guidance and feedback in refining students’ skills.

In light of the relative paucity of research data regarding pace in music teaching, the results of this investigation seem beneficial. We hope that this research not only provides interesting information about the relationships between various aspects of timing and observers’ perceptions of pace, but also suggests a mechanism by which pacing in instructional interactions may be operationalized and quantified. Such a mechanism seems useful not only as a research tool, but, much more importantly, as an additional source of prescriptive information for novices and practicing professionals in need of remediation. Admonishing a novice teacher to “pick up the pace” or “move faster” provides little in the way of prescriptive information. Advising the same novice that the mean duration of their talk episodes exceeds 20 seconds and that they should work to lower that mean to 10–12 seconds not only provides a clear target for change, but also describes a goal that is understandable and doable. This is not to say that achieving such a goal will necessarily solve whatever pacing problems the novice may have, but such specificity may facilitate positive change.

Whether this is actually the case is a question for further experience and research, but the results of this investigation indicate that a large proportion of the variance in observers’ perceptions of pace is explained by the rates of student performance episodes and teacher activity. These data also illustrate an important point about teaching in general: within each teacher’s experience, even within as brief a time scale as a single lesson or rehearsal, there exists a range of differences with regard to each aspect of the teacher’s performance (e.g., pace). The fact that teachers’ professional behavior is not monolithic presents important opportunities for the teacher educator, because within the range of each teacher’s skills are examples of better and worse teaching (Duke, 1994). Thus, the teacher educator or supervisor may help the novice to discriminate among these various levels of teaching quality and to eliminate the poorer aspects while encouraging and reinforcing the better aspects. Rather than relying on verbal descriptions of better teaching or on observations of other, more skilled teachers, novices can use their own best work as models to which they may aspire. These self-models are achievable by definition—it is the very same teacher who is providing the model. The task then becomes one of increasing the frequency and consistency of the aspects of teaching identified as unusually good, thereby raising the overall level of instructional quality.

Classroom interactions in music are multifaceted and complex, which makes the task of systematic assessment of music teaching difficult at best. The search for appropriate dependent measures that may serve not only as evaluative assessments but also as sources of prescrip-
tive information remains one of the most important challenges for research in music education.

NOTE

1. We recorded the durational data (i.e., proportions of excerpt and mean episode durations) for two categories of teacher behavior: talking and demonstrating (or modeling). Talking included any verbalization by the teacher. The duration of each talk episode extended from the beginning of the first utterance by the teacher and continued until the teacher stopped talking and either (1) began to demonstrate or model for the students (in all four excerpts, usually by singing) or (2) elicited a response from the students; thus, each talk episode may have included any number of discrete comments. Demonstrating or modeling included any performance by the teacher (in all four excerpts, including the band rehearsal, this most often involved singing). Durations of three categories of student behavior, indicating who in the class or ensemble was participating, also were recorded: full group, small group, or individual.

Rates per minute were calculated for the five behavior categories just described, and rates per minute were calculated for five categories of teacher verbalization: information statements, directives, questions, positive feedback, negative feedback, and off-task statements. We chose to record teacher behavior by measuring the duration of each episode of teacher talk, irrespective of the number of individual comments each talk episode comprised, and to record the rates of the individual types of teacher verbalizations. This seemed appropriate, since the extent of negative feedback, for example, seems more effectively captured by the rate of individual negative verbalizations rather than by the duration of each statement. It seemed to us most reasonable, in investigating the issue of pacing, to describe teacher verbalizations in terms of the durations of talk episodes, irrespective of the number of comments each episode comprised, and to describe the content of teacher verbalizations in terms of the rates of occurrence.

Information statements are defined as teacher verbalizations that convey information about the activity in which the class is engaged, but do not explicitly direct the students to take action (e.g., “The sopranos have the melody here.” “We’re going to learn each verse before we sing the entire song.” “This is the climax of the piece.” “We will begin at letter A.”). Directive statements command the student or students to take some specific action (e.g., “Make this more smooth.” “Trumpets, play louder!”). Questions include any nonrhetorical question posed by the teacher. Positive and negative feedback statements include any evaluative statements that describe the performance of the students in the class (e.g., “That was terrific.” “You’re still a little behind.”).

Rates per minute were calculated for four categories of student behavior—performance (playing or singing), approximations of performance (e.g., chanting the words of a song, counting the rhythm), verbalizations, and off-task behavior. In the eight excerpts used in this investigation, no off-task behavior was observed, so this category will not be discussed further.

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