

# Interval and Scale-Degree Strategies in Melodic Perception

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The ability to produce and identify intervals and scale-degree patterns contributes greatly to the perception, understanding, and performance of melodies. These musical building blocks form the basis of two contrasting perception strategies, which have emerged from recent music cognition research. This article reviews a small portion of that research, examines diagnostic tools for determining students' approaches, and discusses teaching techniques for promoting the flexible use of these two strategies.

W. Jay Dowling<sup>1</sup> investigated scale-degree versus interval representations in the perception of tonal melodies. Subjects had to recognize melodies in exact transpositions even when they were obscured by being shifted against the established key, thereby systematically altering the scale degrees. The task was thus stacked against those relying solely on a scale-degree strategy. Figure 1 shows sample stimuli. Letter D is the exact transposition of A with altered scale degrees.

The results showed variations in performance according to the subjects' musical experience (see Fig. 2; cross-hatched bars are for stimuli shifted against the key). Inexperienced subjects recognized exact transpositions moderately well regardless of whether scale degrees changed or not. Moderately experienced subjects performed very well with scale degrees held constant but at chance when they were changed. Professionals did very well regardless of conditions. Surprisingly, those with little musical experience performed significantly better than those with moderate experience when asked to recognize exact transpositions with changed scale degrees.

My dissertation investigated expectancy in tonal melody. Freshman and sophomore music majors heard a key-establishing context followed by a pair of tones and were then asked to sing their expectancies for continuation. Clearly some subjects were concentrating pri-

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<sup>1</sup>Complete citations for all sources mentioned are given at the end of the article.

FIGURE 1. Dowling's stimuli (*Music Perception* 3/3 (1986): 284)

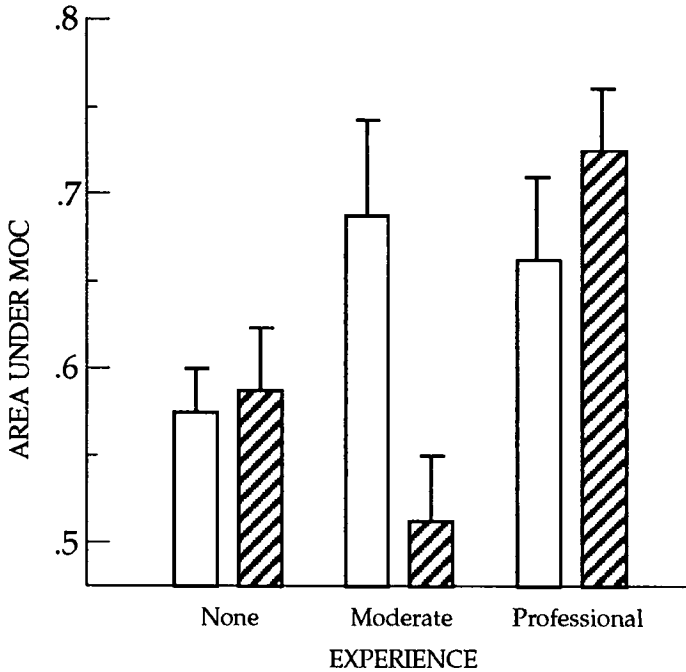
Figure 1 displays five musical staves (A-E) illustrating different contexts for a melody. Each staff shows a sequence of chords and a corresponding melody. The interval pattern (semitones) and scale-step values (pitches) are indicated above and below the melody, respectively. Roman numerals indicate the chord context.

- Staff A:** C: I IV V<sub>7</sub> I. Interval pattern: -5+5+2-7+5. Scale-step values: 1 5 1 2 5 1.
- Staff B:** D: I IV V<sub>7</sub> I. Interval pattern: -5+5+2-7+5. Scale-step values: 1 5 1 2 5 1.
- Staff C:** D: I IV V<sub>7</sub> I. Interval pattern: -5+5+4-9+5. Scale-step values: 1 5 1 3 5 1.
- Staff D:** G: I IV I<sub>4</sub><sup>6</sup> V<sub>7</sub> I. Interval pattern: -5+5+2-7+5. Scale-step values: 5 2 5 6 2 5.
- Staff E:** G: I IV I<sub>4</sub><sup>6</sup> V<sub>7</sub> I. Interval pattern: -5+5+4-9+5. Scale-step values: 5 2 5 7 2 5.

Fig.1 Examples of stimuli in Experiment 1: (A) A novel melody introduced with chordal context ending with the tonic (I) chord; (B) a same-context transposition of A; (C) a same-context imitation of A; (D) a different-context transposition of A; (E) a different-context imitation of A. The Roman numerals under the staves indicate the chord labels in the context; the small numbers above the melodies indicate the interval pattern in semitones; and the small numbers below the melodies indicate the scale-step values of the pitches. Note that transpositions preserve interval pattern exactly, and that the chordal context determines the initial scale-step values.

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**FIGURE 2.** Dowling's chart of results versus experience  
(*Music Perception* 3/3 (1986): 289)



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marily on the interval between the two stimulus tones, since they gave the same continuation for a particular interval even though its scale-degree interpretation changed at each presentation. Other students related the two tones not to each other but to the established key. Their continuations converged on the nearest highly stable tone, producing different continuations for the same interval depending on context.

These perceptual differences can strongly affect student performance on aural skills tasks. Neither approach is ideal for all situations. A scale-degree strategy is most suitable for tonal melodies. A typical problem for an interval thinker is to misjudge a leap and then remain off by a step; thinking scale degrees, however, allows quick reorientation after such a mistake. On the other hand, an interval strategy works best for atonal melodies and passages in tonal melodies that

are modulatory or tonally vague. A typical mistake for a scale-degree thinker, who is not careful about specific intervals, is to alter notes to fit into some key (either imagined or no longer in force). Although some teachers concentrate solely on one or the other approach, the ideal strategy is a flexible one, utilizing intervals and scale degrees depending on the demands of the melody.

The degree to which a student favors one strategy over the other is useful information for an aural skills instructor. Those students strongly adhering to a single strategy need to be guided toward a more flexible approach. Dowling's results suggest that a teacher could predict a student's preferred strategy based on musical experience. He conjectures that: (1) inexperienced listeners code melodies as sequences of pitch intervals, (2) moderately experienced listeners (mean of five years training) code melodies as scale-degree sequences, and (3) professionals (fifteen or more years experience) use a flexible system incorporating both (Dowling, 289).

In contrast, I found different strategies within a homogeneous experience group, and my practical classroom experience corroborates that finding. College aural-skills students usually fall in the high end of Dowling's moderately experienced category. Typically, all three strategies are represented in every class; thus some relatively experienced musicians rely only on interval representations. Dowling's conclusions suggest an odd, although not impossible, developmental sequence. It seems unlikely that students would forget how to listen intervallically while they are learning scale-degree representations, only to recover that ability as professionals.

An alternative hypothesis portrays reliance solely on either intervals or scale-degree representations as a strategy associated with inexperience. With training, music coding strategies become more flexible. The initial preference for intervals or scale degrees then depends on factors such as personality or cognitive style. Support for this notion can be drawn from Charles Schmidt, who found correlations between certain tests of cognitive style and aural skills performance in general. However, even if such a relationship were proven, its practical use would be limited. A teacher may better test directly for listening strategies.

What diagnostic tools can best determine students' strategies? Instead of time-consuming individual singing tests, a short listening test is usually more practical because it can be done quickly en masse. Isolated recognition of either intervals or scale degrees, however, reveals surprisingly little, since many students do not apply these skills in melodic contexts.

Dictation of specially designed tonal and atonal melodies tells a bit more. A tonal melody containing large leaps among members of the tonic triad should be more difficult for interval thinkers. Conversely, a melody with conflicting semitones lacking proper resolutions should be more difficult for scale-degree thinkers. Both, however, can be too difficult for beginning music majors, a number of whom will not be able to produce any response. My experience shows that this sort of diagnostic test is inconclusive in one-third to one-half of the cases.

Dowling's experiment was not intended as a diagnostic exercise, but replicating it produces useful results. It best identifies scale-degree thinkers, because the task is stacked against them. It does not distinguish well between the interval and the flexible strategies. The task is easy enough that a proficient interval thinker can score highly and appear to belong in the flexible-strategy category. Conversely, poor overall performance might be equated with an interval strategy instead of a poorly executed scale-degree strategy. This diagnostic approach tends to be inconclusive in about a quarter of the cases.

A paper-and-pencil variant of my earlier experiment often produces good results. Students rate different continuations of the three ascending major thirds and two descending minor seconds found in a major key, played in random order (see Ex. 1). Those who rate stable tones highly are scale-degree thinkers. Those whose high ratings follow consistent interval patterns (a-d-g, b-e-h, c-f-i, j-l, and k-m—the first and last patterns are most popular) are interval thinkers. This

### EXAMPLE 1. Expectancy-type diagnostic test

Instructions: Rate on a scale of 1 to 7 how good a continuation the third note is of the other two



diagnostic procedure is inconclusive about as often as Dowling's, but it places relatively few cases in the flexible-strategy category. Thus it gives a better indication of which strategy is favored, even for students who employ a moderate degree of flexibility in their perceptual strategy.

After obtaining this information about approaches, a teacher can assign exercises to help students develop the opposite strategy and to use both flexibly. This pedagogy works best when instruction is individualized, but it can also succeed in the traditional monolithic classroom. For example, students of different mindsets can be paired off to work together—to coach each other—on exercises given to the entire class.

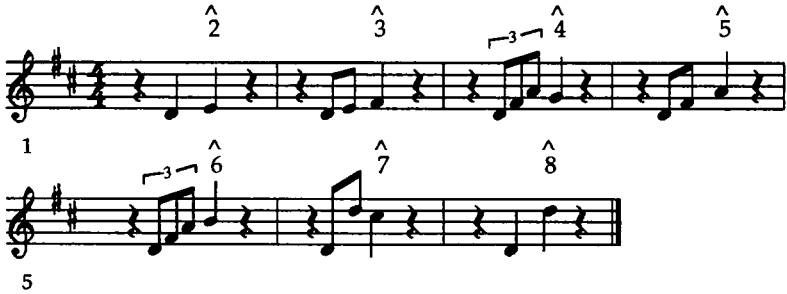
A number of activities can promote this flexibility. Most of them work for both ear training and sight singing and are discussed here after a few prefatory observations. These suggestions are emphatically not arranged in a pedagogical sequence. Although one conventional aural-skills pedagogy begins atomistically and builds up to a full context, my practical experience suggests that some context is necessary from the outset. Probably a spiral approach is best, cycling continually from context to isolation and back. Determining the exact pedagogical sequence to suit a particular situation must be left to the reader.

### **Prefatory Notes**

*Lyrics.* Solmization or other labels act as catalysts to help students bond together musical concepts and sounds. (Bodily motions may also be added for extra reinforcement.) While each of the many solmization systems for scale degrees have pros and cons, some system is probably better than none. For intervals, there are labels—diatonic (e.g., minor second) or chromatic (number of semitones)—and note names. If interval drill is to transfer to melodic tasks, however, it needs to be attached to specific notes and not just to abstract labels. While students may initially find it easier to sing and think without lyrics, in the long run they probably learn more with a system than without.

*Finders.* Have students memorize “finders.” Short exercises containing an instance of every scale degree or interval can be memorized and employed as references. Upon encountering difficulty hearing or singing some scale degree or interval, students can recall (singing if necessary) the corresponding fragment of a finder and check the accuracy of their best guess. Robert Hurwitz's scale-degree finder (Ex. 2) proceeds from *do* to each diatonic degree, either by step or via the tonic triad.

**EXAMPLE 2.** Scale-degree finder (sing also in harmonic minor)  
(adapted from Robert Hurwitz)

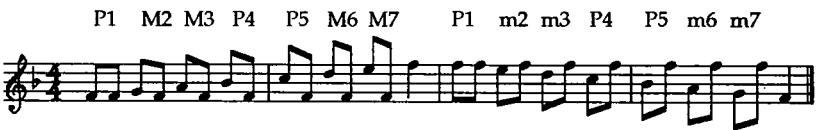


Examples 3 and 4 illustrate two interval finders. Example 3 employs an axis, thereby avoiding tonal associations, and Example 4 places intervals in the context of a major scale. For additional benefit, all of these finders can be performed with the units in scrambled order.

**EXAMPLE 3.** Axial interval finder (adapted from David Cope)



**EXAMPLE 4.** Major-scale interval finder



A note of caution should be sounded here. Knowing a single instance of each concept is merely one step towards a complete understanding. Students must outgrow whatever crutches they use initially, including the ever-popular associations with familiar tunes, since singing and identification of both intervals and scale degrees must be practically instantaneous to be useful in musical contexts.

*Isolated Drill.* Scale degrees and intervals can be sung or identified one at a time without reference to any particular musical context. The goal is to eliminate distractions, allowing concentration on individual items. Presumably repetition with appropriate feedback will result in eventual mastery. Isolation drills are best done on few hearings at steadily increasing tempos, in preparation for their application to real-time singing and dictation.

### Partial Isolation

*Target practice.* Recognition in context helps connect skills learned in isolation to actual music. Students can be given a particular scale degree or interval (the target) on which to concentrate. They must then indicate its occurrence in some manner while singing or hearing a melody. The goal is to match memory of the target to its sound in real time. In sight singing, one could hum a melody, and solmize only

#### EXAMPLE 5. Leap to a target scale degree by many different intervals



#### EXAMPLE 6. Use a target interval to leap to many different scale degrees



specified scale degrees (especially tonic triad tones) or sing the name of a target interval (for example, perfect fourth). In dictation, students can write out as many numbers as there are tones and then either circle the numbers on which the target scale degree occurs or put a check between numbers whose tones form a target interval. As proficiency develops, students may search for several targets at once (for instance, all tonic triad tones).

To intensify such drill, melodies can be specially constructed to employ heavily a particular scale degree or interval. Example 5 leaps to the target, *sol*, by many different intervals. Example 6 uses a target interval, the tritone, to leap to many different scale degrees. This sort of exercise can be very difficult because, unlike a scale-degree target, the actual pitches of the target interval change. For this exercise it is better not to use sequence, since sequences suggest patterns larger than a single interval.

*Fetch.* Students need to be able to focus on any scale degree or interval while singing or listening. To train this ability, one might stop a melody at selected points, recall (singing, if necessary) a particular interval or scale degree, and compare the last tone or interval to it. As proficiency develops, these comparisons can be done without stopping, first on longer tones and later on every tone. The hierarchical nature of tonality may be employed for maximum efficiency: all scale degrees are either tonic triad tones or neighbors to them. Thus only the tonic triad need be held in memory; other degrees can be figured from it. Initially, a tonic/dominant drone can help cement the triad in memory. No comparable hierarchy exists among intervals.

## Context

*Highlights.* Find prominent features of a melodic contour (beginning and ending; cadences; high, low, and turning points; distinctive leaps) and identify the scale degrees or intervals involved. Meter and rhythm can also be considered, by identifying accented degrees or intervals. This exercise promotes application of both scale-degree and interval concepts, letting the context determine which ones are needed.

*Set-ups.* Rather than give the starting pitch when setting up an exercise, have students find it given only the tonic note. This approach encourages position-finding relative to the tonal context.

*Broaden horizons.* A context is more than just the adjacent pitches or intervals. Students should be encouraged to sing or identify scale degrees of, or intervals between, nonadjacent tones (e.g., from down-

**EXAMPLE 7.** Recovery exercise—use scale degrees  
(Chopin, *Mazurka* Op. 59 No. 2)



**EXAMPLE 8.** Recovery exercise—use nonadjacent intervals  
(adapted from Schoenberg, *Klavierstück*, op. 33a)



beat to downbeat). A truly effective strategy cannot proceed solely note-by-note.

*Recovery.* Broadened horizons should help students recover in the middle of an exercise. The goal is to get back on track after mistakes by using scale degrees or nonadjacent intervals. Students can be forced out of the note-to-note rut by interspersing extreme difficulties and easy passages. In Example 7, the beginning moves too fast to follow easily; recognizing  $\hat{5}$  or  $\hat{3}$  in the middle, however, allows one to finish singing or writing down the melody. In Example 8, the large and difficult intervals are framed by tones that form seconds.

*Distraction.* At all levels, working against a distracting context sharpens one's concentration. A scale-degree strategy depends on establishing and remembering a tonal context. Beginners can practice holding in memory at first the tonic alone and later the tonic triad, while listening to distracting speech or music. An interval strategy depends on forgetting or ignoring tonal contexts. Many students fall prey to the tonal implications that interval patterns suggest. One curative is to sing intervals in same-type chains (that is, the last note of one becomes the first note of the next). Such chains may initially suggest a key but always violate it before long. For example, in a chain of four ascending major seconds, there is a tendency to sing a minor second for the fourth note to stay within a diatonic tetrachord. Ad-

vanced students can be challenged by bitonal exercises, approached first in terms of maintaining one key against the other but ultimately of conceiving the two keys at once.

**EXAMPLE 9.** Abrupt modulation (adapted from Schubert)



**EXAMPLE 10.** Real and tonal sequence

(Handel, *Concerto Grosso* Op. 6 No. 12 in B minor, Largo)



**EXAMPLE 11.** Tonal references in atonal music

(adapted from Berg, *Violin Concerto*)



## Flexibility

*New Keys.* To navigate from one key to another involves putting aside one tonal context and taking up a new one. Especially with distant keys, it helps to think intervallically across the juncture. Even beginning students can practice this skill by finding the tonic for each new exercise intervallically from the previous one, and then placing the new tonal context around it. This drill is good preparation for melodies that modulate abruptly (see Ex. 9), since it requires switching quickly between intervallic and scale-degree strategies.

*Combinations.* Once students become somewhat proficient with scale degrees and intervals, one may combine one of each (for example, *ti* and major sixths) in a single drill. Activities described above as target practice, fetch, and highlights are all amenable to this approach.

*Sequence.* Alternating real and tonal sequence also promotes flexibility. Tonal sequence depends on scale degrees, while real sequence typically violates the scale. In Example 10 intervallic thinking is helpful for navigating the chromaticism of the first two legs, but the last interval of the third leg is changed—a good place to return to a scale-degree strategy.

*Tonal/Atonal.* As noted before, tonality usually works best with a scale-degree strategy and atonality with an intervallic one. One could alternate them either from exercise to exercise or within exercises. Ronald Herder's book explores this idea. Some atonal melodies contain tonal references, which can aid in their perception. To sing or take down the tone row in Example 11, it helps to think triadically, or even tonally (beginning in *g* and ending in *E*). Other melodies use pitch centrality or axes, while maintaining a fundamentally intervallic character. In Example 12, *G* and *C#* serve as anchors for the sinuous chromaticism.

**EXAMPLE 12.** Pitch axis within fundamentally intervallic music  
(Bartók, *Mikrokosmos*, no. 115)



sequently, atonal music might be taught much earlier than is customary. Concentrating exclusively on diatonic tonal music for a year or more gives little incentive to develop flexible strategies. Ideally students will combine in singing and listening their understanding of both intervals and scale degrees.

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