European starlings (*Sturnus vulgaris*) are known for mimicking a wide variety of sounds, yet they can be selective in their choice of a model—e.g., they may copy peers in preference to adults, and they fail to imitate humans in the presence of avian companions. Here we ask whether, in the absence of differential contextual cues, starlings prefer to imitate normal starling songs rather than heterospecific songs or starling motifs arranged in an atypical sequence. Because the basis for selectivity may change with age, we also ask whether the starlings' copying preferences vary with age or reproductive condition. Recent findings that starlings can learn arbitrary syntactic rules in a recognition task, and that their ability to learn these rules might be more limited in the presence of avian companions, is consistent with the question of learning predispositions in this species. The findings presented here are based on previously unreported data from series of published song-learning experiments.2,3

### Methods

**Subjects and Housing:** Twelve male starlings were collected from the wild at 8 to 10 days after hatching and hand-reared as a group. After 26 days they were assigned to the normal photoperiod or photoadvanced group and housed individually in sound-attenuated chambers, where they were exposed to an identical set of tape recordings.

**Tutoring Stimuli:** Each tape contained recordings of two normal starling songs (with a mean of 37 motifs in each), a "scrambled" song, and 2 cowbird (*Pyrrhula pyrrhula*) songs. Each tape included 18 repetition of each of the training stimuli in randomized order.

**Song of a wild-caught adult male starling**

![Wild-caught starling song](image)

The wild-caught starling song typically consists of a succession of low notes, variable weaker, thin notes, and high notes, in that order. Inter-note intervals become progressively shorter.

**Scrambled Song**

![Scrambled song](image)

Motifs from a wild-caught starling were rearranged using DNA software from Engineering Design. The resulting scrambled song consisted of 5 motif types and included exemplars of all motif categories. The order of motifs and the intervals between them were determined using a table of random numbers. Each motif type was repeated once.

**Changes in bill color and timing of molt**

![Changes in bill color and timing of molt](image)

The role of social interaction. Wilson Bull. 95: 635-640.

**Song Sampling:** The birds were tape-recorded every week to the age of 9 months, and every two weeks thereafter, to determine when song attained highest stability. We analyzed two 15-minute samples of song for each bird; one recorded in February and another in June-July. The photorefractory birds were molting in February and did not sing.

**Identification of Imitations:** Spectrograms of the subjects' songs were compared by eye with those on the training tapes. Two observers compiled libraries of the subjects' motifs displayed beside any model motifs they resembled. Four independent observers ranked the degree of similarity between potential models and copies on a scale from 1 (poor) to 5 (good). Copies with median ratings of 3 or more were counted as imitations.

**Imitations**

![Imitations](image)

Song motifs acquired by a starling from the photoadvanced group. Median rating of these imitations were 2 (poor) and 4 (good).

**Results**

Repeated-measures ANOVA revealed no significant differences in the proportion of normal, scrambled, or cowbird song copied, regardless of age or reproductive condition. Remember to take into account the unequal number of available models of each type.

**Number of Imitations of Normal, Scrambled, and Cowbird Songs on Tutoring Tapes by Normal Photoperiod and Photoadvanced Starlings**

![Number of Imitations](image)