

Song development in birds tutored with phrase pairs

S.L.Plamondon*; H.J.Gritton; A.T.Baugh; G.J.Rose; F.Goller
Biol., Univ Utah, Salt Lake City, UT, USA

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A study of the developmental trajectory of bird song can offer insight into the process of vocal learning. In a previous experiment we tutored white-crowned sparrows with isolated phrase pairs taken from adult conspecific songs consisting of 5 phrases. One group of sparrows was tutored with forward-order (normal) pairs; a second group heard only reverse-order pairs. We found that birds tutored with phrase pairs produced complete songs (4-5 phrases in tutor order), indicating that exposure to full song during tutoring is not required. We now report the developmental trajectory of song from birds tutored with forward- and reverse-order pairs. We followed the progress of phrase coupling and syntax diversity from early plastic song to crystallization. During the early stages of song development, birds of both groups produced predominantly isolated phrases and phrase pairs; within pairs, phrase type and order was diverse, yet birds expressed a bias toward their respective tutor models (i.e. forward- or reverse-order). This bias was strengthened throughout development, whereby syntax diversity progressively decreased due to the loss of inappropriate phrase combinations. Inter-syllable intervals between tutor-order phrases decreased until the birds produced an accurate copy of the tutor models. Furthermore, phrase composition of the final songs was predicted by the frequency of occurrence of individual phrase types during plastic song. Later in plastic song, birds combined phrase pairs and single phrases to build longer sequences. This process reflected a gradual progression toward crystallized song consisting of 4-5 phrase types, placed in forward or reverse order.

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