Evaluating EP Theories of Music Origins

Parental care, coalition signaling, and group cohesion emerge as the best-supported theories for music's evolution, with mate selection showing only partial support.

Abstract

Ten studies using interdisciplinary, comparative, and empirical methods indicate that accounts of music evolution focused on parental care, coalition signaling, and group cohesion enjoy the strongest support. Fitch (2005) and Savage et al. (2020) report that musical behaviors function as credible signals of parental attention and as mechanisms for coordinating group activity. Empirical work by Hagen and Bryant (2003) links music and dance to signals of coalition quality, while analyses by Morley (2014), Savage et al. (2015), and Oesch (2019) associate musical forms with group coordination and cohesion. In contrast, Darwin's mate selection model appears only partially supported, with studies such as Savage et al. (2020) noting weak connections between musical features and mate quality.

Overall, the findings favor a unifying social bonding framework in which parental care, coalition signaling, and group cohesion overlap in explaining music's evolutionary origins.

Paper search

Using your research question "Which of the primary EP theories for the origins of music is best-supported: mate selection, parental care, coalition signaling, or group cohesion?", we searched across over 126 million academic papers from the Semantic Scholar corpus. We retrieved the 50 papers most relevant to the query.

Screening

We screened in papers that met these criteria:

- **Evolutionary Framework**: Does the study examine evolutionary explanations for musical behavior or musical capacity in humans, including empirical tests of evolutionary psychology theories?
- **Empirical Evidence**: Does the study present original empirical data, systematic review findings, or meta-analytic results (rather than just theoretical discussion or opinion)?
- **Research Focus**: Does the study explicitly connect its findings to evolutionary or adaptive functions of music?
- **Study Type**: Is the study one of the following: (a) cross-cultural research on musical behaviors, (b) comparative human-animal studies, (c) genetic/neurological/developmental research, or (d) systematic review/meta-analysis of music's evolutionary functions?
- **Methodology**: Does the study employ appropriate scientific methodology to test its evolutionary hypotheses or claims?
- **Results Interpretation**: Are the study's conclusions directly related to understanding music's evolutionary origins or adaptive functions?
- **Data Quality**: Does the study provide sufficient data or evidence to support its evolutionary claims about musical behavior or capacity?

We considered all screening questions together and made a holistic judgement about whether to screen in each paper.

Data extraction

We asked a large language model to extract each data column below from each paper. We gave the model the extraction instructions shown below for each column.

- **Study Design Type**:

  Identify the primary type of study design used:

- Theoretical/Review paper
- Comparative analysis
- Statistical analysis
- Empirical research
- Interdisciplinary review

Look in the methods section or study description. If multiple approaches are used, list all that apply in order of prominence. If unclear, note "Design type not explicitly stated".

- **Data Sources and Sample**:

  Specify:

- Total number of music recordings/samples analyzed
- Geographic regions represented
- Sampling method (e.g., global sample, convenience sample)
- Criteria for inclusion/exclusion of musical samples

Extract this information from methodology sections. If precise numbers are not provided, use ranges or approximate values. If no clear sampling method is described, note "Sampling method not specified".

- **Evolutionary Music Origin Theories Examined**:

  List ALL evolutionary theories of music origins discussed in the study:

- Mate selection
- Parental care
- Coalition signaling
- Group cohesion
- Other theories mentioned

Locate these in introduction, discussion, or theoretical sections. Indicate whether the theory was:

- Supported
- Partially supported
- Rejected
- Discussed but not conclusively evaluated

If a theory is mentioned but not substantively analyzed, note "Theory mentioned but not extensively examined".

- **Key Theoretical Arguments**:

  Summarize the primary theoretical arguments related to music's evolutionary origins:

- Main hypotheses proposed

- Key evidence supporting or challenging each hypothesis
- Methodological approach to evaluating the hypothesis

Extract from discussion and conclusion sections. Focus on direct arguments about music's evolutionary function. If no clear argument is presented, note "No definitive theoretical argument proposed".

- **Statistical Universals in Music**:

  Document:

- Number of statistical universals identified
- Domains of these universals (e.g., pitch, rhythm, social context)
- Strength of evidence for universality

Look in results and discussion sections. Prioritize quantitative descriptions of universals. If universals are qualitatively described, note key characteristics. If no clear universals are identified, write "No statistical universals reported".

Results

Characteristics of Included Studies

Study	Study Type	Primary Theory Focus	Evidence Type	Key Findings	Full text retrieved
Fitch, 2005	Theoretical/Review, Comparative analysis, Interdisciplinary review	Multiple theories	Comparative data, Existing theories	Trehub's caregiving model strongly supported; Darwin's "protolanguage" model consistent with evidence	Yes
Fitch, 2006	Theoretical/Review, Comparative analysis, Interdisciplinary review	Multiple theories	Comparative data, Existing theories	No single selective force explains music evolution; past function questions unlikely to be definitively answered	Yes
Hagen and Bryant, 2003	Empirical research	Coalition signaling	Experimental data	Music and dance evolved as a coalition signaling system	Yes

Study	Study Type	Primary Theory Focus	Evidence Type	Key Findings	Full text retrieved
McDermott and Hauser, 2005	Interdisciplinary review	Multiple theories	Existing research synthesis	Some musical features may be innate, but not necessarily music-specific adaptations	Yes
Morley, 2014	Interdisciplinary review	Social and emotional communication	Multidisciplinary evidence synthesis	Musical behaviors are deliberate metrically-organized gestures for social and emotional communication	Yes
Oesch, 2019	Theoretical/Review, Interdisciplinary review, Comparative analysis	Social bonding	Comparative evidence, Existing theories	Social bonding hypothesis primary; music evolved for social bonding and group cohesion	Yes
Ravignani et al., 2013	Theoretical/Review, Comparative analysis, Interdisciplinary review	Multiple theories	Comparative data, Existing theories	Music may have an adaptive value with a social component	No
Savage et al., 2015	Statistical analysis, Empirical research, Comparative analysis	Group coordination and cohesion	Statistical analysis of global music samples	Music's evolutionary function may relate to facilitating group coordination and cohesion	No
Savage et al., 2020	Interdisciplinary review	Social bonding	Multidisciplinary evidence synthesis	Music evolved primarily for social bonding, signaling coalition strength and parental attention	Yes

Study	Study Type	Primary Theory Focus	Evidence Type	Key Findings	Full text retrieved
Schruth, 2022	Comparative analysis, Statistical analysis	Spatial cognition, Mate selection	Comparative primate data, Statistical analysis	Musical features evolved as honest signals of spatial cognition for locomotor tasks related to offspring care	Yes

Our review identified 10 studies examining theories of music evolution, with varying methodologies and levels of evidence.

Study Characteristics

Study Types

- Interdisciplinary reviews: 7 studies
- Comparative analysis: 6 studies
- Theoretical/review approaches: 4 studies
- Empirical research: 2 studies
- Statistical analysis: 2 studies

Primary Theory Focus

- Multiple theories: 4 studies
- Social bonding: 2 studies
- Other focuses (1 study each): coalition signaling, social and emotional communication, group coordination and cohesion, spatial cognition, mate selection

Evidence Types

- Existing theories: 4 studies
- Comparative data/evidence: 3 studies
- Multidisciplinary evidence synthesis: 2 studies
- Statistical analysis: 2 studies
- Other types (1 study each): experimental data, existing research synthesis, comparative primate data

The studies we reviewed did not present a clear consensus on a single theory of music evolution. Instead, they examined various aspects and used diverse methodological approaches.

Thematic Analysis

Evidence for Coalition Signaling

Several studies in our review provided evidence supporting the coalition signaling hypothesis, though the strength of this evidence varied across studies. Hagen and Bryant (2003) provided the most direct evidence for this theory, proposing that music and dance evolved specifically as a coalition signaling system. Their empirical study demonstrated that perceptions of music quality, influenced by synchrony, correlate with perceptions of coalition quality.

This hypothesis is further supported by Savage et al. (2020), who argue that music functions as a credible signal of coalition strength, size, and coordination ability. The idea of music as a signal of group quality is also consistent with the findings of Savage et al. (2015), which suggest that music's evolutionary function may be related to facilitating group coordination and cohesion.

However, it's important to note that while coalition signaling receives strong support, it is often presented as part of a broader framework of social functions rather than as the sole explanation for music's origins.

Social Bonding as Unifying Framework

A recurring theme across multiple studies is the idea of social bonding as a primary function of music, potentially unifying various theories about music's origins. Oesch (2019) explicitly proposes the social bonding hypothesis as the primary explanation for music evolution, suggesting that music evolved specifically for social bonding and group cohesion.

This perspective is echoed in Savage et al. (2020), which presents social bonding as an overarching function that unifies various theories, including coalition signaling and parental care. Morley (2014) similarly emphasizes the social and emotional communication aspects of music, describing musical behaviors as deliberate metrically-organized gestures for these purposes.

The studies we reviewed suggest that the social bonding framework may explain various aspects of music, including its role in group activities and parent-infant interactions. However, as Fitch (2006) notes, it's challenging to definitively prove the past functions of music, and a single explanation may not suffice.

Biological vs Cultural Evolution Evidence

The studies present a nuanced view of the interplay between biological and cultural evolution in shaping music. McDermott and Hauser (2005) suggest that while some musical features may be innate, they are not necessarily specific adaptations for music. This implies a complex interaction between biological predispositions and cultural learning.

Savage et al. (2020) propose a gene-culture coevolution model, where proto-musical behaviors that initially arose as cultural inventions had feedback effects on biological evolution due to their impact on social bonding. This perspective allows for both biological and cultural factors in music's evolution.

Schruth (2022) takes a more biologically-focused approach, suggesting that musical features evolved as honest signals of spatial cognition, linking them to specific cognitive and motor abilities. However, this view doesn't preclude cultural influences in shaping the specific forms of music across societies.

- The reviewed studies suggest:
  - Some innate, biologically-based capacities for music may exist

- Specific forms and functions of music are heavily influenced by cultural factors
- Challenging to disentangle purely biological adaptations from culturally evolved features of music

Comparative Evidence Across Species

Several studies employ comparative approaches, examining musical or proto-musical behaviors across species to inform our understanding of music's evolution in humans. Fitch (2005, 2006) emphasizes the value of comparative data, discussing examples of "animal music" and the convergent evolution of vocal learning in birds, whales, and seals.

Ravignani et al. (2013) advocate for comparative animal research as a useful approach to understanding human music cognition. This comparative perspective allows researchers to identify which aspects of music might be uniquely human and which might have deeper evolutionary roots.

Schruth (2022) provides a specific comparative analysis focusing on primates, linking musical features to brain structures associated with spatial cognition and motor control. This approach offers insights into the potential cognitive precursors of human musical abilities.

The comparative evidence generally supports the idea that while human music is unique in its complexity and cultural diversity, it builds upon cognitive and behavioral foundations that have deeper evolutionary roots. This perspective helps to bridge the gap between biological and cultural explanations for music's origins.

Theory Support Analysis

Theory	Supporting Evidence	Contradicting Evidence	Integration with Other Theories
Mate Selection	Darwin's sexual selection model partially supported (Fitch, 2005)	Weak links between music and mate quality (Savage et al., 2020); Less empirical support as primary driver (Fitch, 2006)	Could be integrated as secondary function alongside social bonding (Savage et al., 2020)
Parental Care	Trehub's caregiving model strongly supported (Fitch, 2005); Supported as credible signal of parental attention (Savage et al., 2020)	No mention found in some studies (Hagen and Bryant, 2003; Oesch, 2019)	Often integrated with social bonding hypothesis (Savage et al., 2020)
Coalition Signaling	Strongly supported (Hagen and Bryant, 2003); Supported as credible signal of coalition strength (Savage et al., 2020)	No explicit contradictions found, but sometimes subsumed under broader social bonding theory	Often integrated with social bonding and group cohesion theories (Savage et al., 2020)

Theory	Supporting Evidence	Contradicting Evidence	Integration with Other Theories
Group Cohesion	Supported (Morley, 2014; Savage et al., 2015; Oesch, 2019)	No explicit contradictions found, but sometimes seen as outcome rather than primary function	Often integrated with social bonding and coalition signaling theories (Savage et al., 2020)
Social Bonding	Strongly supported as overarching function (Oesch, 2019; Savage et al., 2020)	No explicit contradictions found, but some argue for more specific functions	Presented as unifying framework integrating other theories (Savage et al., 2020)

Based on the studies we reviewed, our analysis of the theories of music evolution suggests:

Aspect	Strong Support	Support	Partial Support	Weak Support	Not Extensively Examined
Supporting Evidence	Parental Care, Coalition Signaling, Social Bonding	Group Cohesion	Mate Selection	-	-
Contradicting Evidence	-	-	-	Mate Selection	Parental Care
Integration with Social Bonding	Parental Care, Coalition Signaling, Group Cohesion	-	-	-	-
Other Integration	Social Bonding (unifying framework)	-	Mate Selection (secondary function)	-	-

Synthesis

Theory Interactions and Overlap

The reviewed studies reveal significant interactions and overlap between the various theories of music's evolutionary origins. While each theory emphasizes different aspects of music's function, there's a growing consensus that music likely evolved to serve multiple, interrelated social functions.

The social bonding hypothesis, prominently supported by Oesch (2019) and Savage et al. (2020), emerges as a potential unifying framework. This theory can incorporate elements of coalition signaling, group cohesion, and even parental care, suggesting that music's primary evolutionary function was to facilitate social connections at various levels, from dyadic interactions to large group cohesion.

Coalition signaling, strongly supported by Hagen and Bryant (2003), can be seen as a specific mechanism through which music contributes to social bonding and group cohesion. The synchronization and coordination required in group music-making serve as honest signals of group quality and cohesion, thereby strengthening social bonds.

Parental care, while sometimes treated as a distinct theory, often overlaps with social bonding in the context of infant-directed vocalizations. Savage et al. (2020) integrate this into their broader social bonding framework, suggesting that music serves as a credible signal of parental attention.

The mate selection theory, while less prominently supported, isn't entirely dismissed. Instead, it's often reframed within the context of social bonding and coalition signaling. Musical ability might serve as an honest signal of individual quality, but primarily in the context of one's ability to contribute to group cohesion and cooperation.

Temporal Development of Musical Functions

- Potential temporal development of music's functions:
  - Early stage: Proto-musical behaviors for coordinated group activities (coalition signaling hypothesis)
  - Later stage: Broader social bonding functions
  - Extended function: Facilitation of larger-scale social cohesion

The development of more complex musical forms might have then allowed for more nuanced social signaling, including parental care signals and potentially mate attraction. However, these more individualistic functions appear to be secondary to the broader social bonding role of music.

Schruth's (2022) focus on spatial cognition and locomotor tasks offers an intriguing perspective on the early cognitive foundations that might have predisposed humans to develop musical behaviors. This suggests that the evolution of music might be deeply intertwined with the development of other cognitive and motor abilities.

Current Consensus and Disagreements

The studies we reviewed suggest a trend towards emphasizing the primacy of social functions in theories about the evolution of music. Most researchers agree that music played a crucial role in facilitating group cohesion and social bonding, with specific mechanisms like coalition signaling contributing to these broader functions.

However, disagreements persist regarding the relative importance of different social functions and the extent to which music represents a specific adaptation versus a byproduct of other cognitive abilities. Some researchers, like Fitch (2006), caution against overly adaptationist accounts and suggest that questions about music's past functions might be impossible to answer definitively.

There's also ongoing debate about the balance between biological and cultural factors in music's evolution. While some studies focus on potentially innate features of music perception (McDermott and Hauser, 2005), others emphasize the role of cultural learning and gene-culture coevolution (Savage et al., 2020).

Despite these disagreements, the overall trend in the literature points towards a multifaceted view of music's evolution, with social bonding and group cohesion at its core. This perspective allows for the integration

of multiple theories and acknowledges the complex interplay between biological predispositions and cultural innovations in shaping human musical behaviors.

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