Are Music and Language Homologues?

STEVEN BROWN

Department of Clinical Neuroscience, Karolinska Institute,
Huddinge University Hospital M98, 141 86 Huddinge, Sweden

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I have argued previously that music and language are homologous functions that evolved from a common ancestor that embodied their shared features, something that I have called the "musilanguage" system.[1] According to this model, the shared/parallel features of music and language evolved before their distinct, domain-specific features. These parallel features include use of a limited pool of discrete building blocks, arranged combinatorially, to generate structured phrases, modulated by expressive phrasing mechanisms.

In thinking about the evolutionary relationship between music and language, it is useful to make a distinction between three types of features and to consider models for their respective brain localizations (see FIG. 1): (1) shared features, (2) parallel features, and (3) distinct features. Shared features are those that are identical between music and language, and would include the general processes of vocalization as well as affective prosody, that is, the expression of emotional states in music or language. Parallel features are those that are analogous (but not identical) between music and language, and would include the features of discreteness, combinatoriality, phrase formation, and phrasing mentioned above. Finally, the distinct features are those that are specific to each domain and are therefore neither shared nor parallel, and would include music's use of isometric rhythms and pitch blends and language's use of words and propositional syntax.

I want to propose a model for how these three types of features could be instantiated in the modern brain starting from a bilaterally symmetric "musilanguage" system in the early hominid brain: (1) shared features are mediated by shared modules, (2) parallel features are mediated by duplicate modules, and (3) distinct features are mediated by diverse neural areas whose arrangements are not predictable a priori. The idea of shared modules implies that during the divergence of music and language from the "musilanguage" precursor, both functions came to adopt the same neural areas for the same functions. By contrast, the idea of duplicate modules suggests that during the divergence process, parallel functions developed as specializations in either the left or right hemisphere, where homologous functions came to occupy more-or-less corresponding positions in the two hemispheres. Finally, local-

Address for correspondence: Steven Brown, Department of Clinical Neuroscience, Karolinska Institute, Huddinge University Hospital M98, 14186 Huddinge, Sweden. Voice: +46-8-5858-6867; fax: +46-8-5858-6865.
steven.brown@neuro.ki.se

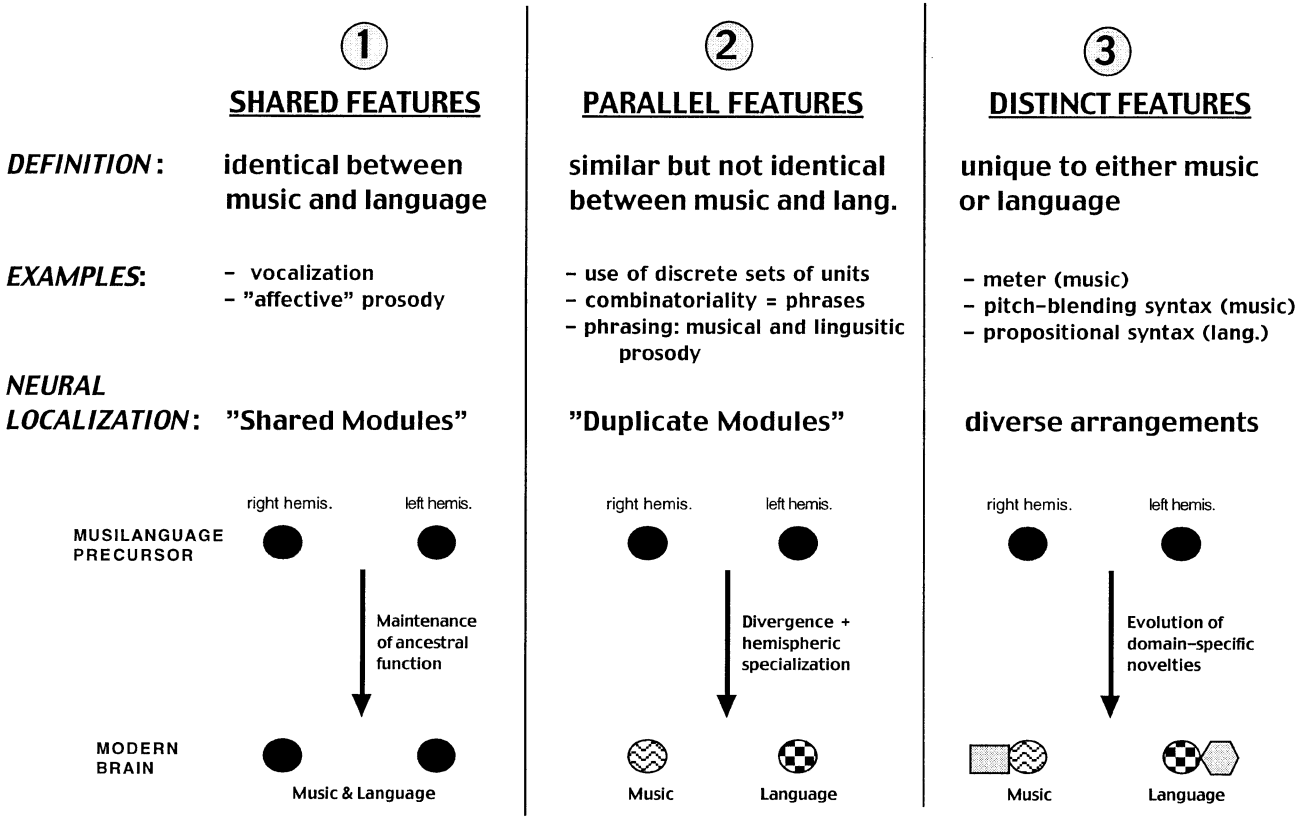
1
SHARED FEATURES
DEFINITION: identical between music and language
EXAMPLES: - vocalization - "affective" prosody
NEURAL LOCALIZATION: "Shared Modules"
right hemis.
left hemis.
MUSILANGUAGE PRECURSOR
Maintenance of ancestral function
MODERN BRAIN
Music & Language
2
PARALLEL FEATURES
similar but not identical between music and lang.
- use of discrete sets of units
- combinatoriality = phrases
- phrasing: musical and lingusitic prosody
"Duplicate Modules"
right hemis.
left hemis.
Divergence + hemispheric specialization
Music
Language
3
DISTINCT FEATURES
unique to either music or language
- meter (music)
- pitch-blending syntax (music)
- propositional syntax (lang.)
diverse arrangements
right hemis.
left hemis.
Evolution of domain-specific novelties
Music
Language

FIGURE 1.

ization of the distinct features does not depend on sharing or parallelism and therefore occurs in a diversity of arrangements.

From the neuroimaging literature, we can identify examples of each of these arrangements. Regarding sharing, the neural substrates for vocalizing[2] and reading[3] either music or language seem to involve a high degree of sharing or overlap. The evidence for duplication lies with the correspondence between the localizations of musical and language functions in the brain, notably with regard to the superior temporal cortex (area 22) and inferior frontal cortex (especially areas 44 and 45). For example, a study by Zatorre *et al*. of musical imagery for songs *with* words showed significant bilateral activation in these areas,[4] whereas Halpern and Zatorre's study of imagery for songs *without* words showed preferential activation of these same areas in the right hemisphere only.[5] Finally, the domain-specific features of music and language (such as meter, absolute pitch, word lexicons, propositional syntax) seem to show a diversity of arrangements that are distinct from those related to the shared and parallel features.

Such an overall trichotomy of cognitive features and neural localizations, while highly speculative, could be useful in designing neuroimaging experiments to disentangle music and language in the brain. The notion that music and language are homologues could explain much about the similarities and differences between these two human-specific forms of auditory communication.

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