ASSOCIATION OF MEANING IN PROGRAM MUSIC: ON DENOTATION, INHERENCE, AND ONOMATOPOEIA

Mihailo Antović, Dušan Stamenković, & Vladimir Figar
University of Niš, Niš, Serbia

We tested three theses on the construction of extramusical meaning in program music: (1) that some excerpts contain an “inherent” musical structure that facilitates the interpretation aligned with the composer’s intentions; (2) that “onomatopoeia” — musical imitation of natural sounds — is a frequent subclass of this “inheritance”; and (3) that providing the title of the piece further facilitates the “proper” interpretation of intended meaning. Two hundred and one students were given six musical stimuli (three based on “inherent” and three on “arbitrary” association) and asked to write a one-sentence description of extramusical meaning associated with the examples. In the first trial, all participants provided descriptions without a suggestion. In the second, they were randomly assigned to three groups, receiving suggestions that were neutral, aligned with the composer’s program, or deliberately worded to contradict this program. Three raters then coded the responses on the basis of conformity with the composer’s intentions and presence of onomatopoeia. The result was (a) no difference in the numbers of conformant descriptions to “inherent” as opposed to “arbitrary” examples; (b) a negligible number of onomatopoeic descriptions; (c) a strong influence of “false” — but not “true” — suggestions. We discuss some implications for further studies of extramusical meaning.

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Musical meaning is a much discussed concept that scholars approach from numerous angles. While some authors reject the idea that music can have semantic content (Kivy, 2002), supporters take a variety of positions, looking for them in the formal one (Bernstein, 2001), in musical affect (Jackendoff & Lerdahl, 2006), in emotions triggered by the music (Juslin & Laukka, 2003), in image schemas (Brower, 2000) or conceptual metaphors underlying music perception and analysis (Zbikowski, 2002), in conceptual blends of music and the extramusical (Brandt, 2008), or in broader semiotic connections between music and the world of experience (Agawu, 2008; Hatten, 2004).

Introducing some system behind such diversified approaches, Koelsch (2013, p. 157) proposes a useful tri-partite classification into intramusical, musicogenic, and extramusical meaning. The first class pertains to formal, intrinsic structural relations among musical elements, the second to physical, emotional, or personal effects elicited by the music, and the third to “conceptual” meaning, where a musical sign relates to a referent from the world of experience.

The present study deals with extramusical meaning. It empirically tests three interrelated ideas on the interpretation of composer intentions in program music: (1) that some program pieces contain an inherent musical structure which facilitates “proper” extramusical interpretation; (2) that there is a subclass of such inherent structure in which this interpretation is based on the recognition that the music physically imitates a natural sound; and (3) that the provision of a short verbal clue explicitly introducing the composer’s program helps the participants to reach, and ultimately verbally report, this proper interpretation.

Our three research ideas have been inspired by various authors’ attempts to provide a finer-grained classification of extramusical semantic phenomena. For instance, Koelsch (2013) follows Karbusicky (1986) and ultimately Peirce (1931/1958) in proposing that extramusical meaning can be “iconic” (with the musical information resembling the sounds or qualities of objects), “indexical” (emerging from the inner states of the individual), and “symbolic” (coming from arbitrary extramusical associations). Davies (1994, pp. 29-36) defines five classes of extramusical meaning, from natural and unintended to arbitrary and symbolic, while Cross (2011) offers an essentially binary distinction, based on “either (culturally-shaped) association, or a fit between the acoustical characteristics of a musical fragment and its inferable communicative function” (p. 118).
The first question of the present study derives from this last distinction, revived recently in Pérez-Sobrino’s (2014) classification of two categories of semantic inference in program music: “inherent” and “ad hoc” subsidiarity, which are subclasses of what she calls “dependency enrichment.” It is important to stress that the present work is not investigating the complex classifications of metonymic processes in music internal to Pérez-Sobrino’s theoretical model. Rather, we are using the broad distinction into the inherent and ad hoc categories exemplified by six musical excerpts from her article as inspiration for our own research question of whether composer-intended extramusical meaning is more transparent to participants in the inherent class. As our study deals with associative processes, we label the first group inherent association (resembling HaCohen & Wagner’s, 1997, “inherent” and Koelsch’s, 2013, “iconic”) and the second arbitrary association (close to Koelsch’s “symbolic” meaning, Davies’, 1994, “intentional, arbitrary stipulation of stand-alone meaning,” or Cross’s, 2001, “culturally-shaped association”).

With regard to the second question, we searched the participants’ descriptions for lexical items invoking the imitation of natural sounds. We take this to be indicative of the extramusical meaning construction process which, following numerous authors comprehensively listed in Castelões (2009), we label musical “onomatopoeia.” The concept corresponds to the first subclass of Koelsch’s “iconic meaning” (musical information resembling the sounds of objects) and is also closely related to Pérez-Sobrino’s “echoing” – “an operation whereby music directly imitates a sound from the physical world,” as in the violin trills in Vivaldi’s Spring

Our third question revisits HaCohen and Wagner (1997), who applied Osgood’s semantic differential and an original method labeled the “semantic integral” onto participants’ interpretation of Wagner’s leitmotifs. Their participants first rated predefined connotations on Likert scales, and then invented “denotive” titles for the leitmotifs. Overall, the results confirmed both that the leitmotifs bore “inherent meaning” and that the relationship between their connotative and denotative aspects was “complementary” (p. 145). Thus, we define musical descriptions with no prior contextual clue as based on musical connotations, and descriptions following the explicit verbal prompt as derived from musical denotations.

We put forward the following hypotheses:

1. [Inherence]: The classification into “inherent” and “arbitrary association” fails. With or without explicit verbal prompts, participants do not report the intended extramusical meaning in the former group significantly more often than in the latter.
2. [Onomatopoeia]: Descriptions of music with lexical items referring to the imitation of natural sounds are rare, even in excerpts claimed to explicitly utilize imitation (Vivaldi).
3. [Denotation]: The subsequent provision of context (in the form of the title of the piece and one additional sentence aligned with the composer’s program) changes the extramusical interpretation, biasing the description toward the composer’s intention.

Method

Participants
The participants included 201 nonmusician students from the University of Niš English Department (Mage = 21.37 years, SD = 1.27; 69% women).

Stimuli
We used the six musical excerpts investigated in Pérez-Sobrino (2014). Three were based on “inherent association”: 1) violin trills in Vivaldi’s Spring imitating the chirp of birds; 2) Schubert’s Gretchen by the Spinning Wheel in which “circular” patterns in the piano resemble the image of a wheel that revolves; and 3) Grieg’s In the Hall of the Mountain King, in which the staccato maps onto the walking of the main character, Peer Gynt. The remaining excerpts were based on “arbitrary association”: 4) Papageno’s piccolo motive in The Magic Flute; 5) Ravel’s use of the pentatonic scale to introduce an oriental mood in Laideronnette, Empress of the Pagodas; and 6) Wagner’s sword motif from The Ring of the Nibelung. The “arbitrary” examples were selected based on the global musical similarity with the “inherent” excerpts (all classical pieces, one in each group is played by the piano, a medium-sized and a full-blown orchestra, there is a person singing in German in one piece in each group). All six stimuli contained the particular parts of scores indicated by Pérez-Sobrino and were 28 seconds in length.\(^1\)

Procedure
While not identical, our methodology was inspired by HaCohen and Wagner’s (1997) “semantic integral” method. These authors used participants’ freely invented titles to assemble “modular” names of Wagner’s pieces, in

\(^1\) The complete stimuli and verbal suggestions are available online at: http://www.cogsci.ni.ac.rs/experiment_meaning_music.html
an effort to predict the range of possible extramusical meanings that listeners from the same cultural circumstances could ascribe to the leitmotifs. Our study took a different turn: we looked for free-form associations to programmatic musical motives, played either alone or after pre-devised titles, where the "appropriateness" of these titles to the composer's intention was controlled for. Rather than compiling more generic extramusical meanings, we assessed the conformance of the descriptions to the composer’s alleged intentions, ensuring the objectivity of assessment through the calculation of inter-rater agreement. Our protocols found support in Osgood’s representational mediation theory, where a meaning of the (musical) sign is established through association with its (nonmusical) significate, and the linguistic description (behavioral “response”) is a consequence of mediated, internal self-stimulation (cf. Berlyne, 1971, see p. 111). In Osgood’s own words “Whenever some stimulus other than the significate [e.g. the violin trill] is contiguous with the significate [e.g. the chirp of birds], it will acquire an increment of association with some portion of the total behavior elicited by the significate as a representational mediation process” (Osgood, Suci, & Tannenbaum, 1957, p. 6).

We thus asked the participants to listen to six musical examples and write a single-sentence report on what the pieces reminded them of. The experiment took place in identical small classrooms, with 18 to 25 participants per session. The stimuli were played on a laptop computer with a pair of Genius 2.1 CH surround speakers. Their order was counterbalanced across participants.

The participants heard every stimulus three times: after the introductory trial, they were asked to write down the name of the composer/piece. Those who did this correctly were excluded from calculations for the particular stimulus (54 situations, or 4.48%). Naturally, answers to the remaining stimuli by the same person were retained, in practice resulting in a slight variation to total numbers of answers per stimulus. Upon the second listening, the participants were required to write down in one sentence their native language what, from the world of experience, the segment reminded them of and why. In the final trial, they were asked to repeat the task after reading a short text that contained two sentences. Here the participants were randomly assigned to three groups: 1) the control group was given neutral instructions, describing only the formal musical parameters, such as the number of bars and size of the orchestra; 2) experimental group 1 was given “proper” instructions containing the title of the piece and one more sentence in line with the composer’s program; 3) experimental group 2 was given “wrong” instructions, where we invented an “antonymic” title of the piece followed by one sentence deliberately “opposite” of the composer’s program (see Footnote 1).

DATA ANALYSIS
Respondents’ free-form descriptions were coded into quantifiable variables. Related to Hypothesis 1, the variable “conformance” had two values: “salient” and “nonsalient,” where “salient” responses were in line with the composer’s apparent intentions, in two levels of polysemy for each stimulus: (1) Vivaldi – anything related to birdsong or birds (cf. Pérez-Sobrino, 2014, p. 133); (2) Schubert: a wheel or an object rotating around an axis (p. 138); (3) Grieg: human or any animate footsteps (p. 143); (4) Mozart: hunter of birds or any animal that can be hunted (p. 142); (5) Ravel: any invocation of Asia or the Orient (p. 144); (6) Wagner: any association to a sword or fight (p. 147).

The second variable (“onomatopoeia”) related to Hypothesis 2 and was coded as “onomatopoeic” (pure sound, e.g., buzz, whir, screech, twitter), and “nononomatopoeic.” In relation to the common thesis of music cognition theorists affiliated with cognitive linguistics that musical meaning is based on “image schemas” (e.g., Cox, 1999; Saslaw, 1996; Zbikowski, 1998), we divided the “nononomatopoeic” category of descriptions into “image-schematic” (images, spatial movement, interaction of forces, e.g., a battle, a person walking, a waterfall) and “non image-schematic” (technical terms, e.g., “low tones,” emotional qualities, e.g. “sad,” descriptions of contexts where similar music was heard rather than of the music itself, e.g. “It’s like The Lord of the Rings”).

With regard to Hypothesis 3, in all three groups we compared the number of “salient” responses before and after the suggestion. We also tested if the participants changed their opinion after the suggestion, based on the presence of new concepts in the latter description. Finally, we checked if any change in experimental group 2 was in line with the false suggestion, containing at least one new concept from the false suggestion.

The coding was conducted independently by two raters. Cohen’s Kappa (κ) for all relevant variables taken together was .77 (indicating “substantial agreement,” Landis & Koch, 1977). The value for “conformance” alone (“salient”/”nonsalient”) was .86 (“almost perfect agreement”). Agreement on the number of onomatopoeias was total (1.0). Yet, when we broke down the “nononomatopoeic” category in two segments (“image-schematic” and “non image-schematic”), κ reduced to .66 (still in the range of “substantial agreement”). In other words, there was a bit of controversy
on whether some responses were image-schematic, but no dissent on onomatopoeias.

Finally, the two coders and the third author met to decide on instances of disagreement. The final decision was almost always unanimous, with only six cases requiring a majority vote, after which the final database was compiled.

**Results**

The distributions of “salient” and “nonsalient” responses to pieces based on “inherent” and “arbitrary” association did not significantly differ after the first listening, i.e. in the entire sample without a suggestion: $\chi^2(1) = 0.88, p = .35$, $V = .03$ (Table 1):

Moreover, there were no differences in these distributions after “neutral” and “false” suggestions in control and experimental group 2 – control: $\chi^2(1) = 0.47, p = .49$, $V = .04$; experimental group 2: $\chi^2(1) = 0.00, p = 1.00$, $V = .01$. After “proper” prompts in experimental group 1 there were significantly more “salient” responses to arbitrary and not inherent stimuli: $\chi^2(1) = 7.38, p < .01$, $V = .15$ (Figure 1):

To test whether there was still a gradation in the number of salient descriptions from the “arbitrary” toward the “inherent” category, we allocated the descriptions into three groups by the number of salient answers (based on the analysis of confidence intervals, $p < .05$, Figure 2):

We did not get a scale in which “inherent” pieces slowly give way to “arbitrary” ones in terms of the “degree of inherence.” Rather, the distribution into three categories was relatively even, making Wagner as “highly inherent” as Grieg, Mozart and Ravel as “medium inherent” as Vivaldi, and Schubert alone “least inherent.”

In terms of the relative transparency of intended extramusical meaning in the three examples from the “inherent association” group, Grieg was interpreted correctly without prompts most often, followed by Vivaldi, and then by Schubert ($p < .05$, Figure 2).

As for Hypothesis 2, we had 54 onomatopoeic and 1,096 nononomatopoeic responses, of which 764 could be classified as image-schematic and 364 as non image-schematic. In other words, there were about twenty times fewer onomatopoeic than nononomatopoeic descriptions.

Per response, the number of onomatopoeias was negligible. The most cases were noted in Ravel (12

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**TABLE 1. Distribution of Salient and Nonsalient Responses – Inherent vs. Arbitrary Association**

<table>
<thead>
<tr>
<th>Conformance</th>
<th>Salient</th>
<th>Nonsalient</th>
<th>TOTAL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inherent</td>
<td>123 (21.77%)</td>
<td>442 (78.23%)</td>
<td>565 (100%)</td>
</tr>
<tr>
<td>Arbitrary</td>
<td>142 (24.27%)</td>
<td>443 (75.73%)</td>
<td>585 (100%)</td>
</tr>
<tr>
<td>TOTAL</td>
<td>265 (23.04%)</td>
<td>885 (76.96%)</td>
<td>1150 (100%)</td>
</tr>
</tbody>
</table>

*Note: in the entire sample, without a suggestion.*
instances, or 6.06%) and Vivaldi (22 descriptions, or 11.89%). With Ravel, seven onomatopoeic responses invoked the sound of raindrops or flowing water (perhaps interesting as the princess in Ravel’s program is taking a bath). In Vivaldi, of 22 onomatopoeic answers, only 11 (5.95%) invoked birdsong (chirp, twitter), while the rest had nothing to do with birds, their song or even spring.

With regard to Hypothesis 3, there were no significant differences in the number of “salient” responses before and after the suggestion in control and experimental group 1 – control: \( \chi^2(1) = 0.56, p = .45, V = .03 \); experimental group 1: \( \chi^2(1) = 0.01, p = .92, V = .01 \), but there was a statistically significant decrease in this number after the “false” suggestion in experimental group 2: \( \chi^2(1) = 15.85, p < .01, V = .15 \) (Figure 3).

The number of changed descriptions increased after suggestions in experimental group 1 as compared with the control group, \( \chi^2(1) = 31.02, p < .01, V = .20 \), and rose further in experimental group 2, as compared with both control and experimental group 1 – in this last case, \( \chi^2(1) = 26.14, p < .01, V = .19 \). Of the total 265 changes in experimental group two, 203 were related to the content of the suggestion (76.60%).

Discussion

HaCohen and Wagner’s (1997) study demonstrated “that the leitmotifs bear inherent meaning” and “substantiated the existence of complementary relations between the connotative and denotative aspects of the leitmotifs [. . .] disclosing essential characteristics of the semantic structure of music in general” (p. 154). It appears that our experiment has provided a result opposite to theirs, as the relations between connotations and denotations in our examples were hardly complementary. First, providing “proper” titles did not increase the number of responses aligned with the composer’s program (denotation did not enhance connotation). Second, titles deliberately contradicting the composer’s intention sparked a significant decrease in the number of “salient” responses (thus the “wrong” denotation managed to “override” the apparent connotation). One caveat is necessary here, however. HaCohen and Wagner explicitly focused on Wagner’s leitmotifs. Since in our study, too, the sole example by Wagner fared quite high on the “inherence” scale, we believe a composer-specific follow-up is warranted.

The present work was also inspired by Pérez-Sobrino’s (2014) broad classification into inherent and ad hoc subsidiarity. While we reiterate that our methodology has not tested the specific predictions on musical metonymy from this model, our results seem to put to question some of its underlying assumptions about the bases of musical meaning. For instance, Pérez-Sobrino claims that the identification of the chirp of birds in the Vivaldi segment should be easy and manifest, exemplifying “the most direct form of perceived similarity” between the music and the extramusical program (p. 137). Likewise, she expects that familiarity with the title, at least in Vivaldi and Grieg, will facilitate the listeners’ understanding of the composer’s intended meanings (p. 133 and 143). Neither of these assumptions has been corroborated in the present work.

We therefore propose that prior to engaging in the very important theoretical debates about the nature of the cognitive process through which participants understand composers’ programmatic intentions (e.g., associations, conceptual blending, metonymy), we should first empirically “establish the phenomenon” (Merton, 1987): under what conditions are these intentions actually grasped? In the present study “inherent” structure and explicit two-sentence prompts have not motivated an increased number of “correct” interpretations. This of course does not deny the concept of meaning generation in program music, but only vouches for further work on what conditions need to be met for “proper,” composer-intended extramusical interpretations to be induced. Further studies should look into the minimum “degree of suggestion” needed to entrench the association between the music and the extramusical (a longer text, repeated exposure to the text, visual animations rather than verbal suggestions). Likewise, once the “proper” extramusical interpretation has been entrenched, one could wonder how it may motivate and/or constrain subsequent extramusical meanings associated with the musical theme. This is especially relevant as we often witness in the media that well-known music gets (ab)used in originally
unintended contexts. Methodologically, the present work has used a technique based on free-form associations, supported by Osgood’s notion of representational mediation. Further studies could resort to more established experimental methods, perhaps the full semantic differential protocols. We still hope that our results, especially the apparent openness of listeners to interpretations that counter the intentions of the composer, provide some contribution to the fledgling discipline of musical semantics.

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Correspondence concerning this article should be addressed to Mihailo Antović, Faculty of Philosophy, Center for Cognitive Sciences, University of Niš, Cirila i Metodija 2, 18000 Niš, Serbia. E-mail: mantovic@gmail.com, mihailo.antovic@filfak.ni.ac.rs

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