Explorative Comparison of Children Songs

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Rie Matsunaga PhD & Dr. Sebastian Jentschke
Music is the universal language of mankind (Longfellow, 1865, p. 202)

Music takes as many forms as culture (Cross, 2008, p. 2)
Introduction

- Which features make up a child song?
  - universal genre of communication between children?
  - language specific features?
  - influence of social context (lullaby vs play song)
universality in musical genres?

- McDermott & Hauser 2005*
  - every known scale system is based on the octave
  - scale systems often include unequal interval relations
    - as in western major / minor
  - scales consist of 5 to 7 tones within 1 octave
  - small intervals occur most often (2 semitones)

- are these principles reflected in the most basic musical genres, i.e. childsongs and lullabies?
influence of lang on music


• collected musical themes from France and England
• found differences within variability of tone lengths (nPVI)

\[
nPVI = \frac{100}{m-1} \times \sum_{k=1}^{m-1} \left| \frac{d_k - d_{k+1}}{d_k + d_{k+1}} \right|, \]

Grabe&Low 2002

• higher for English (stress timed), smaller for French (syllable timed) themes
• conclusion: ling features are evident in music
• determined our choice of midi corpora
influence of social context
lullabies vs playsongs

- lullabies are sung all over the world
- are recognizable regardless of musical culture (Trehub, Unyk, & Trainor, 1993)
- are rated as “simple”, compared to AD*-songs
- carry similar features like ID*-speech (Falk, 2011a+b)
- yet the musical features that make up an ID-song have not been thoroughly investigated yet

* AD: adult directed; ID: infant directed
Method

- 4 corpora of child songs
  - obtained from freely available midi collections (mamalisa.com) and songbooks
  - resemble rhythmic classes (Dauer 1983)

- stress timed German
- syllable timed Spanish
- mora timed Japanese
- unclassified Korean

- all composed in western tonal music
Analysis

- midi files have been segmented into melodic phrases by native speakers of the respective language (-Korean)
- melodic phrase determined upon text distribution (verse) or personal intuition
- analyzed in MATLAB with midi toolbox (Eerola&Toiviainen 2004)
- all files transposed to c-major to compare pitch distribution
## Amount of Songs per Collection

<table>
<thead>
<tr>
<th>Song Class</th>
<th>Lullaby</th>
<th>Playsong</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>German</td>
<td>70</td>
<td>59</td>
<td>129</td>
</tr>
<tr>
<td>Japanese</td>
<td>26</td>
<td>46</td>
<td>72</td>
</tr>
<tr>
<td>Korean</td>
<td>2</td>
<td>40</td>
<td>42</td>
</tr>
<tr>
<td>Spanish</td>
<td>6</td>
<td>67</td>
<td>73</td>
</tr>
<tr>
<td>Total</td>
<td>104</td>
<td>212</td>
<td>316</td>
</tr>
</tbody>
</table>
Results 1: Universal Features?

<table>
<thead>
<tr>
<th></th>
<th>German</th>
<th>Japanese</th>
<th>Korean</th>
<th>Spanish</th>
</tr>
</thead>
<tbody>
<tr>
<td>songlength</td>
<td>45.06 (17.279)</td>
<td>49.63 (29.3)</td>
<td>43.2 (19.90)</td>
<td>46.8 (24.310)</td>
</tr>
<tr>
<td>no of phrases/song</td>
<td>~6</td>
<td>~6</td>
<td>~6</td>
<td>~6</td>
</tr>
<tr>
<td>ambitus</td>
<td>11.78 (2.6)</td>
<td>10.99 (3.5)</td>
<td>10.57 (3.6)</td>
<td>10.6 (2.76)</td>
</tr>
<tr>
<td>notedensity_sec</td>
<td>2.07 (0.66)</td>
<td>2.35 (0.6)</td>
<td>2.3 (0.6)</td>
<td>2.6 (0.5)</td>
</tr>
<tr>
<td>nPVI</td>
<td>32.1 (15.6)</td>
<td>37.9 (25.7)</td>
<td>37.4 (18.7)</td>
<td>31.1 (13.0)</td>
</tr>
</tbody>
</table>

- strong overlap in gross structure, melodic and rhythmic features
- also apparent from pitch class and intervall distribution, not shown here
Results 2: Influence of ling features?

- not apparent from classical component (nPVI)
- future research?
Results 3: Influence of social context - lullabies vs playsongs

- ambitus
  - lullabies (12,18 semitones) > playsongs (10,66 semitones)

- nPVI
  - lullabies (37,16) > playsongs (32,29)

- no significant differences
Contour Types

- 15 contour types – derived from Adams 1976
- decreasing, increasing, steady slope, 0 to 2 turning points
Contour Types in Playsongs vs Lullabies

Contour Distribution Playsongs

Contour Distribution Lullabies
Contour Types per Language

German

Spanish

Japanese

Korean
Contour Types per Language

German

Spanish

Japanese

Korean
General Discussion

- more similarities than differences between songs
- neither language nor social context cause musical features to vary
- influence of western tonal music
- more in depth analysis
Discussion & Future Research

• do lullabies support language acquisition?
  – acquisition of prosodic contours, other suprasegmental features of L1; Schön, D. et al., 2008, Cognition
  – future research with speech samples

• is there overlap in contour type distribution between music and language?
  – Simone Falk studies (Falk, 2011, a+b)

• maybe the difference between lullaby and playsong becomes only evident in performance of song – differences are in acoustics, not in musical structure (Trainor et al., 1997)

• music interesting to consider when investigating language :)

Thank you for your attention!

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References