



From Hook to Chorus

Exploring the relation between song structure and music listening behavior of children

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1. Introduction

Children are a **distinct** consumer group from mainstream users of music recommender systems (RS) - systems that recommend music to users according to their preferences, such as Spotify or Apple Music. Still, they are often **overlooked** in the design of RS. It is important that RS are able to cater to children's preferences, which are also changing as children **develop their musical taste**, so that children get recommended the music they want to listen to.

Different **musical features** can capture children's music preferences and can be used in RS to predict which music to suggest. Research has investigated **mostly based on a genre**, sometimes expanding to simple musical features (tempo, loudness). This **leaves room for other aspects** of music to be explored.

RQ: "To what degree does the structure of songs relate to music listening behavior of children in different age groups?"

In our work, we introduce and investigate **song structure**, the arrangement of songs into sections (such as Verses or Choruses), as a musical trait to see whether we can identify and contribute to the knowledge on musical preferences of children. We apply **age bucketing on educational level** to investigate differences within the children groups and incorporate adults for reference.

2. Setup & Methods

Dataset
The **LFM2B** dataset provides data on user's music listening history in the form of listening events (LEs): *user 'x' has listened to track 'y' when they were 'z' years of age*. We produce an extension with the **Genius Expertise** dataset using Fuzzy Matching techniques, to additionally obtain the song's lyrics, which are annotated with sections.

[Intro]
Look, if you had one shot or one opportunity
To seize everything you ever wanted in one moment
Would you capture it or just let it slip?

Age bucketing on educational level
The dataset is limited to data ranging from when users were 12 to 64 years old, constraining us to **two children age groups**.

- Middle School (MS) (ages 12-14), High School (HS) (ages 15-17)
- Adults (≥18)

Representation
We represent song structure as a 42-dimensional vector, the **song structure fingerprint (SSF)**, capturing for 14 song sections:

- Amount - *How many times the section appears in a song*
- Average position - *At which indexed position in the chronological list of the song's sections, this section appears on average*
- Standard deviation of the section's position

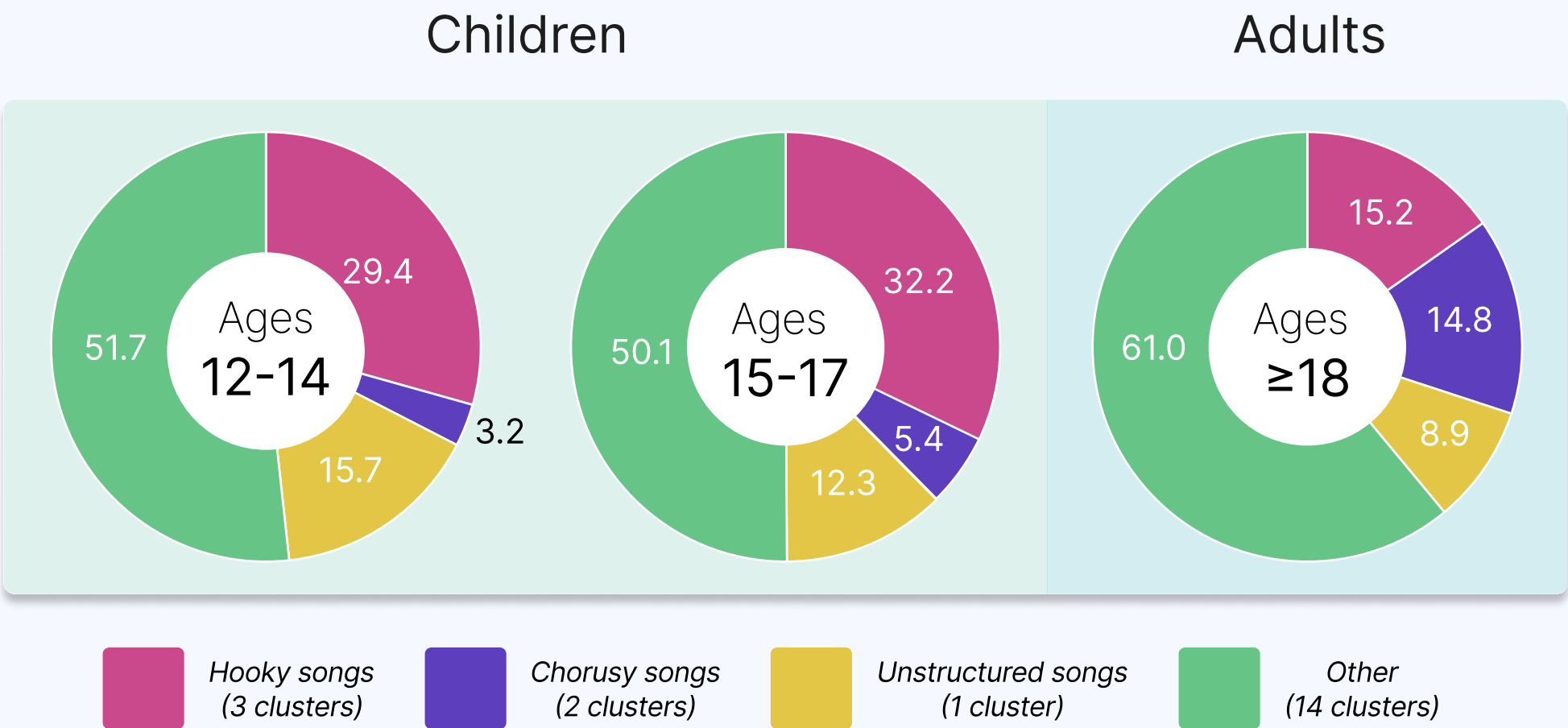
Methods

1. We use **k-means clustering** ($k=20$, through elbow method) on the extracted SSFs to group songs on structural similarities.
2. We calculate the **representation of clusters** in the LEs of the age groups. Statistical significance of differences in the representations is tested using the **Chi-square** method, adopting $\alpha = 5\%$.
3. We **identify** the clusters for which we see the most salient differences across the age groups and **interpret** their meaning utilizing the structural characteristics for which they differ most.

3. Results & Conclusion

(1) Nuances are hard to capture
Despite statistical significance of the differences, the shares of the clusters in the LEs of children in age groups **MS and HS are very similar**, with most differences not exceeding an absolute percentage point of 1.8%. This indicates that we are **unable to capture nuanced differences** in music preferences of **between children age groups** through the lens of our representation of song structure. Due to uncertainties about the completeness of the dataset's section annotations, we refrain from concluding differences observed in songs that lack structure (Unstructured songs).

(2) Children seem to be captured more by (lyrical) hooks than adults, who instead prefer choruses.
Hooks and *choruses* are both **memorable and catchy** sections of songs, although **hooks are considered shorter and catchier**, often repeated, and choruses convey larger meaning of songs.



We observe a **large decrease** from children to adults in the representation of (the 3) clusters characterized by the presence of many hooks (**hooky songs**), and a **large increase** for (the 2) clusters characterized by the presence of pre-choruses, choruses and post-choruses (**chorusy songs**). This could be an indicator that **children generally strongly prefer catchy parts of song**.

Future research can investigate whether more nuanced preferences can be uncovered when considering not only lyrical, but also **melodical and rhythmical hooks** through song audio analysis. In addition, the effect of **RS performance on children** when RS favor songs with more lyrical hooks should be investigated to see if this yields any benefit.