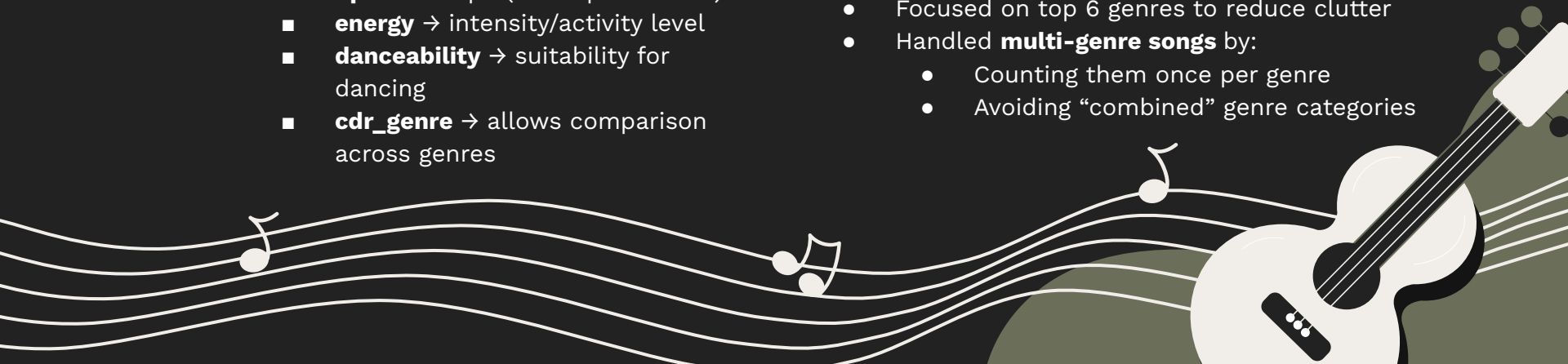
How #1 Hits Have Changed: Tempo (BPM), Energy, and Danceability Across Decades and Genres

By Team Concussion

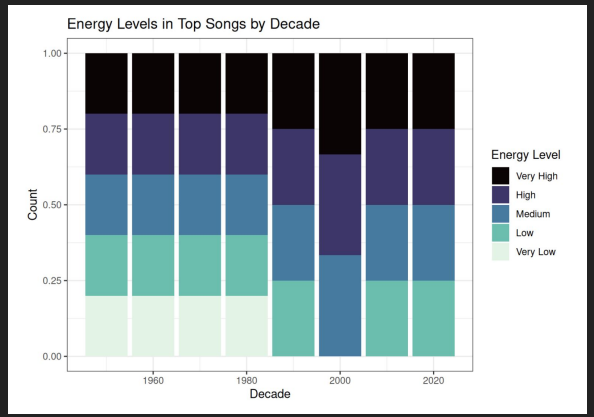
Question + Data Set

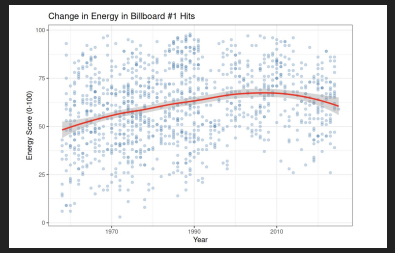
- Our Focus: how the sound of **#1 songs has changed over time** based on measurable scores
- Using:
    - Dataset: **Billboard Hot 100 #1 songs (TidyTuesday)**
    - Covers songs from **1958–2025**
    - Each observation = one #1 song
    - Includes: **1,177**
        - Date, artist, genre
        - **bpm** → tempo (beats per minute)
        - **energy** → intensity/activity level
        - **danceability** → suitability for dancing
        - **cdr_genre** → allows comparison across genres

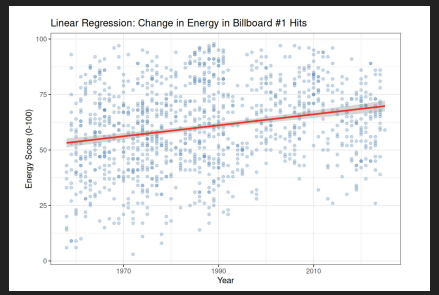
- **New variables** to measure time differently
    - Decade, year
- Removed na values **only for variable we were using,** rather than universally removing observations if they had one na value (to keep data set sizes as large as possible)
- Divided scores (energy and danceability) into **categories** - very high, high, low, etc. - to reveal **broad patterns**
- Focused on top 6 genres to reduce clutter
- Handled **multi-genre songs** by:
    - Counting them once per genre
    - Avoiding “combined” genre categories



How Has Energy Changed Over Time?



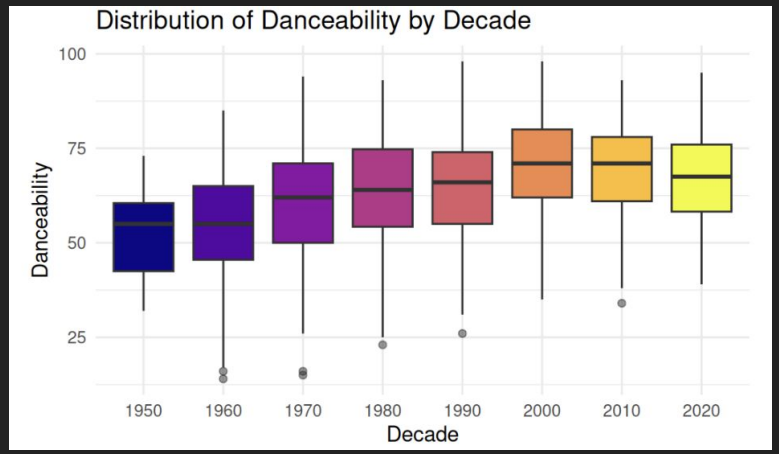


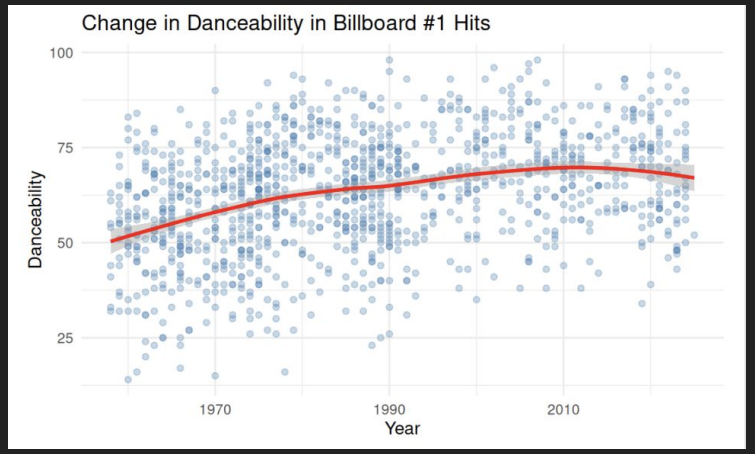


$$\widehat{Energy} = -431.16 + 0.247 \times year$$

- Energy shows a **slight upward trend over time** (~+0.25/year)
- Trend is **statistically significant but weak** (low p-value, low $R^2 \approx 0.06$)
- Indicates **small increase with high variability**
- Energy **rises from mid-1900s to early 2000s**
- **Levels off / slightly declines** in recent years
- Suggests trend is **not purely linear**
- Shift toward **more high and very high energy songs over time**
- **Very low energy songs become rare** in later decade
- Overall pattern shows **movement toward higher energy music**

How has Danceability Changed Over Time?

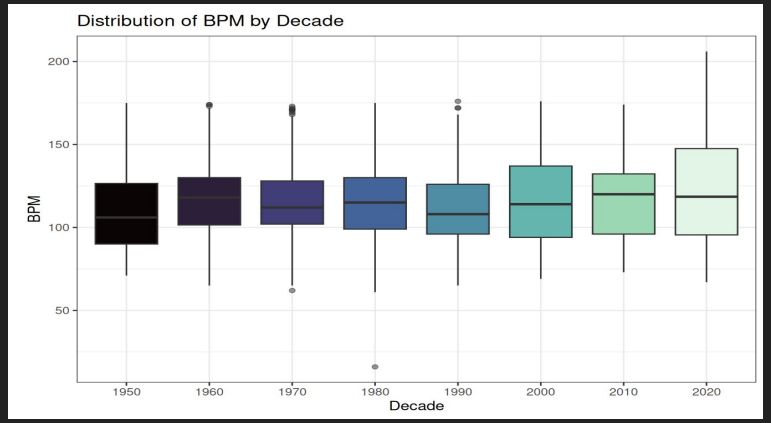


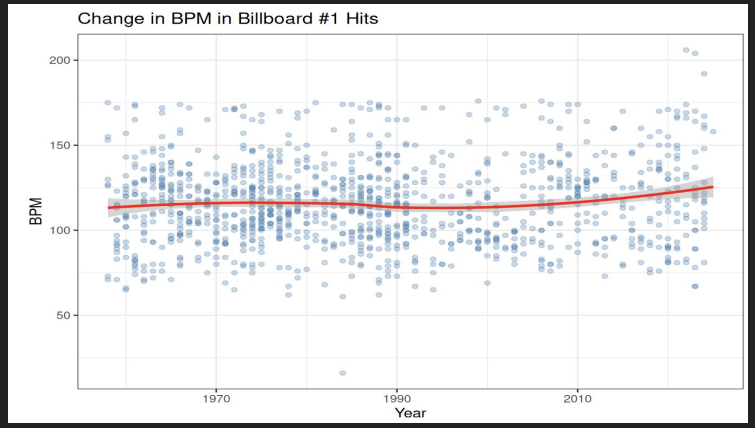


- Danceability shows a clear but **moderate upward trend** over time
- Danceability distributions shift upward across decades
- Later chart-toppers are more **concentrated** in **high danceability** categories
- Top songs remain fairly **variable** in danceability across all eras
- The trend **peaks** around the **2000s–2010s** and then flattens slightly

$$\widehat{Danceability} = -487.30 + 0.277 \times year$$

How Has BPM Changed Over Time?

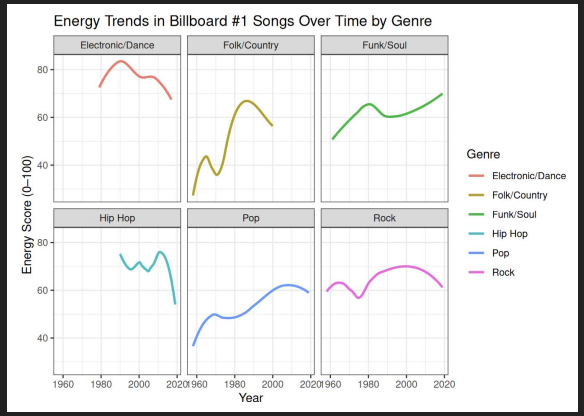


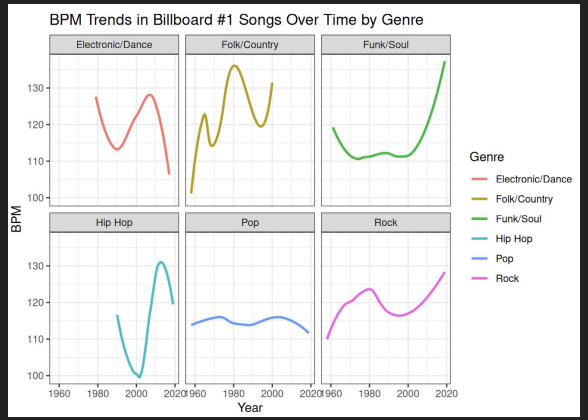


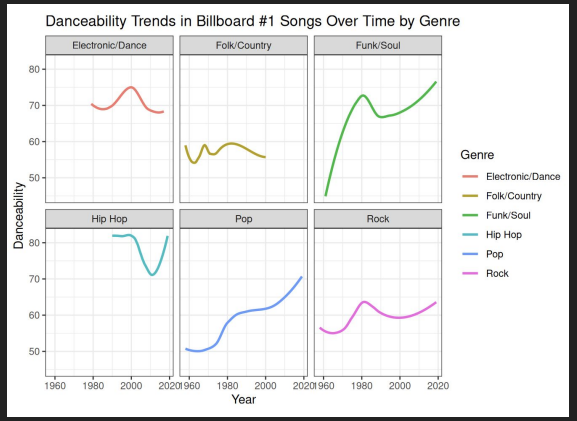
- BPM shows only a **slight upward trend** over time
- BPM values **overlap heavily** across decades
- Top songs remain **highly variable** in tempo across all eras
- **$R^2 \approx 0.003$**, so year explains almost none of the variation in BPM

$$\widehat{BPM} = -38.90 + 0.078 \times year$$

Trends Across Genres



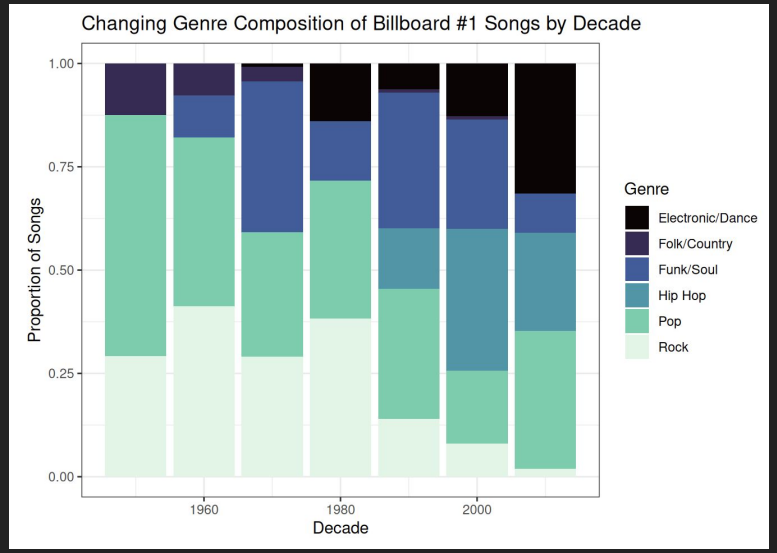




Key takeaway:

- Energy and Danceability trends are driven most by **Pop and Funk/Soul**, not all genres
- Tempo has not systematically shifted in any genre

Genre Composition Change Over Time



- Genre composition explains **why trends in energy and danceability increase over time**
- 1950s–1970s being dominated by Pop and Rock aligns with lower energy (~40–50) and moderate danceability (~50)
- From 1980s onward **Hip Hop and Electronic/Dance** expand significantly. These genres enter **already high (energy 75+, danceability 70–80)**, which **reinforces trends**, not drive the increase
- **Pop and Funk/Soul** both increase in energy and danceability, **contributing directly to upward trends**
- Overall increases are driven by a combination of **within-genre changes (Pop, Funk/Soul)** and **composition shifts toward high-energy genres (Hip Hop, Electronic)**

Discussion

Overall Findings

- Billboard #1 songs become **more energetic and more danceable over time, while BPM remains stable**
- Increases are not uniform across genres but **driven by genre composition shifts**
- Later decades are **dominated by high-energy, high-danceability genres**
- Overall trends we see are happening because **different genres are becoming more popular, not because all genres are changing in the same way**

Limitations

- **Only #1 songs**, reflecting dominance, not full music landscape **(selection bias)**
- **Energy and danceability are derived**, not fully capture complexity of musical style/ listener experience
- **Multi-genre songs counted multiple times**
- **Only top 6 genres** → declutters findings but excludes smaller but potentially important genres
- Tradeoff: **improves interpretability but reduces precision**

Future Work

- Broader set of songs beyond #1 hits to better capture overall musical trends
- Exploring other musical features (e.g., loudness, acousticness, lyrical content) or external factors (e.g., streaming era effects)