

Exploring Green Day's Music Over Time*

Justin Klip, Dhruv Gupta

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1 Introduction

Green Day has been performing and producing music for nearly 30 years. With such longevity, it begs the question of how much this music has varied over time. In this paper, we explore traits of Green Day's music. In particular, we examine the average valence, energy, and tempo of their songs from year to year. We find that the energy does not change very much at all, staying at a high level of around 0.88 for most years on average. Valence changes more on average, with 2004 onward having a lower level of valence compared to the before then, dropping from 0.75 to around 0.5 in some places. The tempo varied the most, jumping between around 150 and 120 beats per minute and moved erratically from yearly average to yearly average. In Section 2 we document these findings in higher detail and plot the data. The [appendix](#) shows how the data was gathered and cleaned.

2 Results

Figure 1 plots the average energy of Green Day songs from their first album in 1990 to 2024. We notice very little variance in the energy of Green Day songs over time. Every single year in which an album was released an average energy above 0.75 at least. For the most part it stays at 0.88 with little fluctuation particularly in the later years. This is quite a high level, suggesting Green Day's style revolves around high energy. This makes given their punk rock music, which typically requires very high energy to fit into that genre.

*Code and data are available at: https://github.com/justinklip/green_day_study

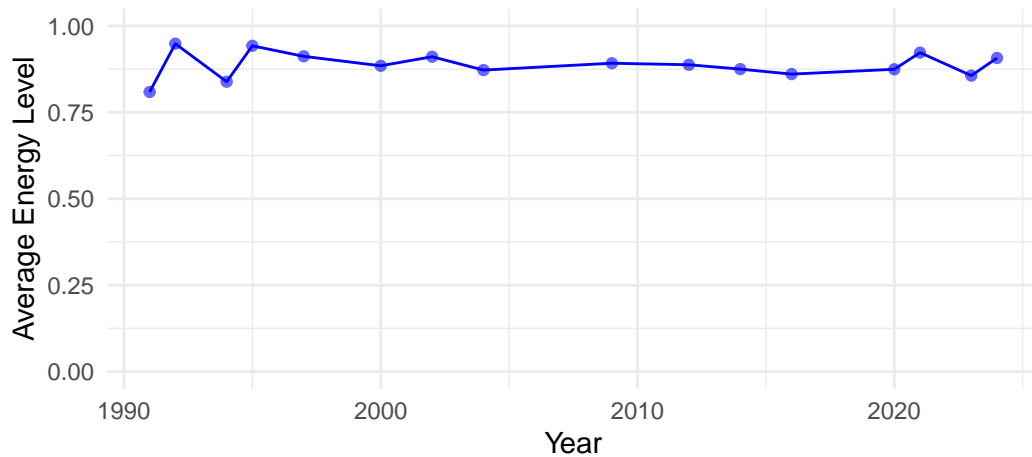


Figure 1: Average Energy of Green Day Songs, 1991 to 2024.

Figure 2 plots the yearly average valence of Green Day Songs from 1991 to 2024 each year they had an album. What is surprising is that the average valence generally stays above 0.5 even at its lowest. Considering that songs like Boulevard of Broken Dreams and Bang Bang are some of Green Day's most famous, our graph seems to suggest that those songs are outliers in regard to the rest of the songs, or that Spotify has a rather low bar for what is considered 'happy'.

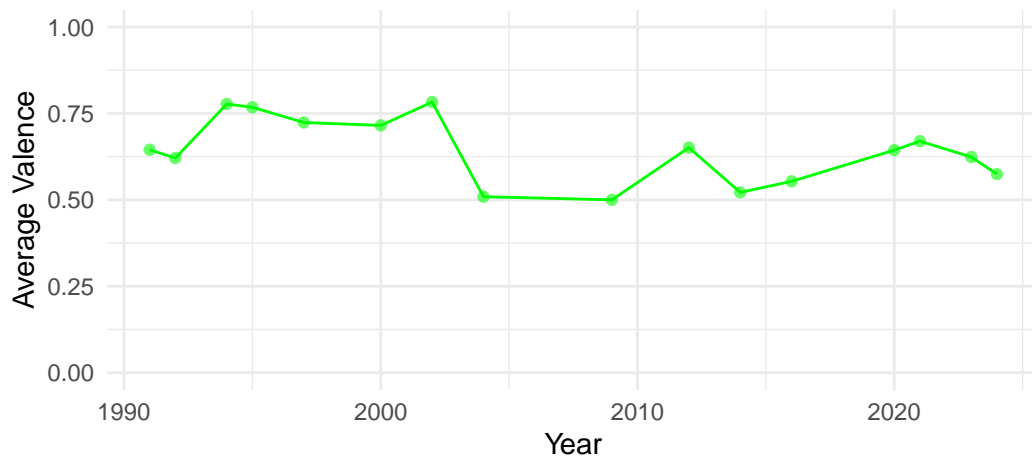


Figure 2: Average Valence of Green Day Songs, 1991 to 2024.

Figure 3 plots the average tempo of Green Day songs from 1991 to 2024 for every year that they had released an album. We find that the tempo from year to year is much more variable than our other two variables. This could likely be attributed to certain periods and albums

emphasizing different aspects in their music. We also notice that the valence seems to track in opposite directions to the tempo. In years where the tempo is high, the valence is low and vice-versa. This is noticeable particularly in the 2000s to 2010s, where there is a sharp rise in tempo but a moderate decrease in valence.

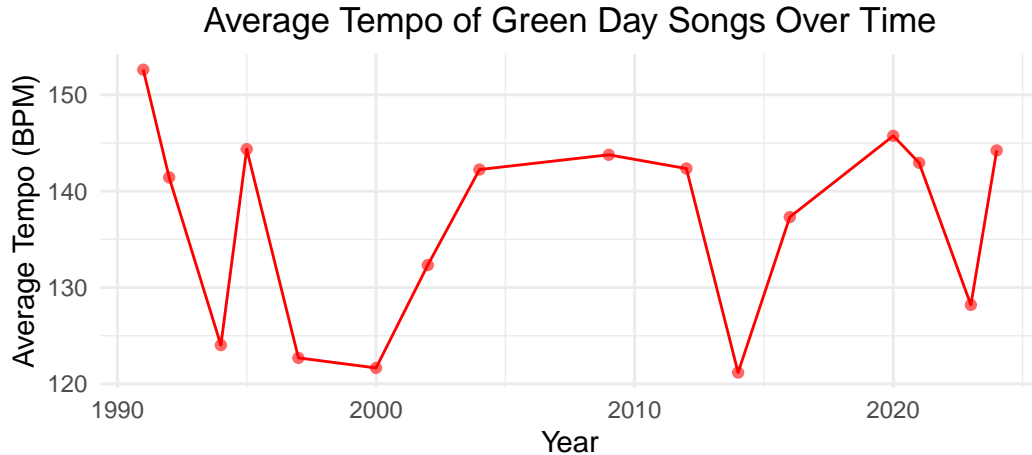


Figure 3: Average Tempo of Green Day Songs, 1991 to 2024.

Overall the results highlight the relative consistency of Green Day’s music over time. This is particularly present in energy, but can even be seen in valence and tempo. While there is more jumpiness in these two other variables, it is clear that there is a distinct Green Day style and that can be seen in the data.

3 Appendix

The data used in this study is obtained using Spotify’s Developer Tools API (Spotify Developers 2024). In particular, the `spotifyr` R package was used (Thompson 2019). Data was downloaded using the API and appropriately cleaned, removing duplicates, missing values, and cleaning the column names. For the data collection, analysis, and paper formatting, the packages [Wickham et al. (2023)],(Wickham 2016), (Müller 2020), (Xie 2023a), (Grolemund and Wickham 2011), (Csárdi et al. 2024) (Xie 2023b), and (Wickham et al. 2024) were used.

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