The Power of Suggestion: Do Recommender Systems Change Our Musical Preferences?

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Research Problem

To determine if music recommender systems (MRS) affect users' musical preferences

A previous literature review suggests MRS may impact user preferences by limiting musical exposure (Mennell, 2023)

Despite mass adoption of MRS, research is sparse compared to recommender system impacts upon social media, politics, and consumer behaviour (Mennell, 2023)

Significance

Research on extrinsic decision making often forms the basis of MRS studies (Adomavicius et al., 2021; Karayanni & Nelken, 2022; Reiss, 2012)

Humans interpret music information in a different manner to extrinsically linked information (Crooke, 2016; Sachs et al., 2016; Schmidhuber, 2010)

Music preference generally is dictated by the intrinsic reward system (Gold et al., 2019; Rentfrow et al., 2011)

Differences in intrinsic and extrinsic decision-making have been postulated since Aristotle (Gold et al., 2019; Reiss, 2004)

Research Aims and Objectives

These objectives aim to remedy gaps in currently literature (Mennell, 2023):

1. Perform foundational experiments with music information
2. Collect user preference data without inducing bias
3. Establish or refute causation between MRS usage and preference changes
4. Understand impacts of human-machine relationships

Trends in Existing Literature

Recommender systems limit information exposure from which users can develop preferences (Mennell, 2023)

Exposure to music information influences development of music preferences (Zajonc, 2006)

Inherent design of recommender services provides increasingly heterogeneous results (Helberger et al., 2018)

Prominent Works

Leading works for this problem set (Mennell, 2023):

Adomavicius et al., 2021
Effects of Personalized and Aggregate Top-N Recommendation Lists on User Preference Ratings

Diversity by Design in Music Recommender Systems
Porcaro et al., 2021

Current challenges and visions in music recommender systems research
Shedl et al., 2018

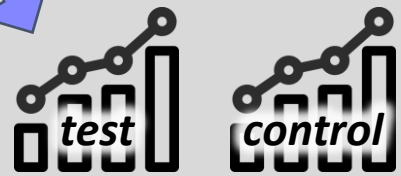
Limitations and Gaps in Current Literature

Limitation	Resultant Gap
MRS studies are nascent, with assumptions drawn from non-music experiments (Porcaro et al., 2021)	Direct experimentation of recommender services and musical preferences
Numerical rating schemes have been used to measure preferences (Adomavicius et al., 2021), but may introduce bias (Hadaway & Marler, 2005)	Objective collection of experiment data

Research Design and Methodology

Field experiment with a test group and a control group to quantitively compare MRS and non-MRS performance

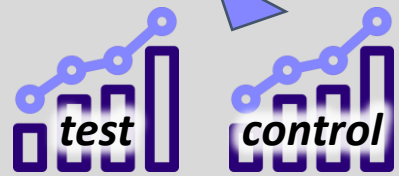
	Phase I: Baseline	Phase II: MRS Intervention	Phase III: Post-MRS Collection
Test Group	Activity data collected MRS function **disabled**	Activity data collected MRS function **enabled**	Activity data collected MRS function **disabled**
Control Group	Activity data collected MRS function **disabled**	Activity data collected MRS function **disabled**	Activity data collected MRS function **disabled**



Baseline profiles

Post-Experiment Analysis

Compare change in test preferences (*tΔp*) with change in control preferences (*cΔp*)



Post-MRS profiles

Objective 1: Conduct Experiments with Music Information

- Leverage music library or platform with a representatively diverse sample and quantity of music
- Develop ability to collect user playback data
- Activate/deactivate MRS by phase for test and control group

Objective 2: Collect User Data Without Bias

- Obtain subject activity data the platform instead users
- Collect data during experiment phases to develop user baseline and post-intervention profiles:

Genre	Classical	Rock		Pop	Latin			*Repeats for all genres*
Count	3	7		0	10			
Percentage	15%	35%		0%	50%			
Artist	Vivaldi	Queen	Rush	*[All Pop Artists]*	Maná	Juan Gabriel		*Repeats for all artists*
Count	3	5	2	0	5	5		
Percentage	15%	25%	10%	0%	25%	25%		
Song	Four Seasons: Winter	One Vision	Radio Gaga	Tom Sawyer	*[All Artist Songs]*	Oye Mi Amor	Querida	Así Fue	*Repeats for all songs*
Count	3	4	1	2	0	5	3	2	
Percentage	15%	20%	5%	10%	0%	25%	15%	10%	

Objective 3: Attribute Changes to MRS Exposure

- Seasonal, psychological, social, economic, and political factors affect musical preferences (Park et al., 2019; Pettijohn et al., 2010)
- Year-long phases allow mitigation of seasonal variance (Park et al., 2019)
- Consecutive phase performance minimises uncontrolled variables (Paluck & Cialdini, 2014)

Post-Experiment Quantitative Analysis

Compare baseline and post-intervention profiles to identify change in musical preferences, or Δp

Calculate mean of Δp for the test group ($t\Delta p$) and the control group ($c\Delta p$)

Post-Experiment Quantitative Analysis
• If $t\Delta p > c\Delta p$, MRS increase preference variation
• If $t\Delta p < c\Delta p$, MRS decrease preference variation
• If $t\Delta p = c\Delta p$, MRS do not affect preference

Timeline

Activity	Year 1				Year 2				Year 3				Year 4				Year 5	
	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2
Plan & Prepare																		
Pilot Experiment																		
Recovery																		
Experiment Phase I																		
Experiment Phase II																		
Experiment Phase III																		
Analysis & Production																		

Research Considerations and Risks

Consideration or Risk	Mitigation
Field experiments subject to uncontrolled variables (Paluck & Cialdini, 2014)	Maximise experiment sample size (Roy et al., 2016)
Misuse of music platform contaminates subject data	Explain experiment rationale and purpose to subjects prior to obtaining participation consent
Classification of music genres is inconsistent (Cuadrado-García et al., 2022; Vlegels & Lievens, 2017)	Use same genre classifications throughout experiment, prohibit comparing genres between users
Long experiment duration yields subject attrition (Paluck & Cialdini, 2014)	Maximise experiment sample size (Roy et al., 2016), and incentivise participation with free music platform access
Experiment duration and sample size requires significant costs and resources	Conduct a pilot study to validate and refine tools, methods, and analytical techniques

Ethical Considerations and Risks

Consideration or Risk	Mitigation
Experiment may impact subject musical preferences	Subjects already exposed to large scale MRS usage; brief subjects prior to obtaining consent
Data collection subject to international regulations such as GDPR (European Union, 2016)	Data collection terms explained in subject consent agreement (GDPR EU, 2023)
Data breach or other unauthorised disclosure	Anonymise data with randomly generated user IDs

Study Artefacts and Follow-on Research

Artefacts from proposed research:

- Field experiment report with quantitative assessment of preference change (Δp)
- Raw data collected from Phases I, II, III
- Synthesized baseline and post-MRS profiles for each anonymised user

Future research opportunities:

- Variation of MRS impact on musical genre, season, or time
- Recommender system influence on human intrinsic reward systems

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