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01

Introduction



Background Research

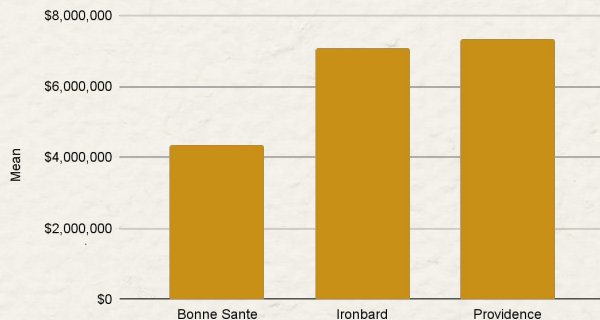
🎵 Why music?

- Music **influences memory and attention** — especially for young children
- Prior research shows that active music training can **enhance cognitive performance**, but limited studies on the effects of passive listening

📍 Why Bonne Santé island?

- **Lowest average household wealth** among all islands
- Lower income students often lack access to cognitive enrichment (e.g. tutoring)
- Need for **cost-effective, scalable** interventions that support academic development

Mean Wealth of Islands



Impact: Explore music as a low-cost tool to bridge learning gaps in under-resourced communities



Research Question

How does **passive listening** to **different music genres** affect **memory performance** among **elementary school children** on the island of **Bonne Santé**?

02

Experimental Design – RCBD

$$y_{ijk} = \mu + \alpha_i + \tau_j + \beta_k + \epsilon_{ijk} \quad \begin{cases} i = 1, 2 \\ j = 1, 2, 3 \\ k = 1, 2 \end{cases}$$

where y_{ijk} is the ijk^{th} observation, μ is overall mean, α_i is the effect of the i^{th} grade level, τ_j is the effect of the j^{th} music genre, β_k is the effect of the k^{th} gender and ϵ_{ijk} is the random error



Treatment Factor – Music Genre



Classical Music



Country Music



Heavy Metal Music

Nuisance Factors

1. Grade Level



Grade 1-3

Grade 4-6

2. Gender



Male

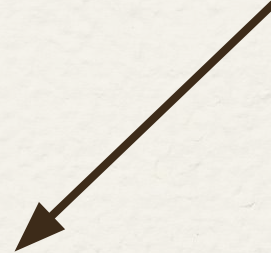
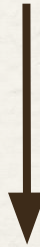
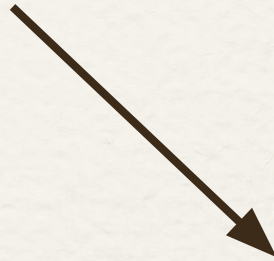
Female

Sample Size Determination

Effect Size: 0.35

Treatment Levels: 3

α : 0.05



Replicates per Group: 48

Proportional Stratified Sampling

01

Select a school

02

Randomly select k students from all lower division boys in that school

- Value of k allocated proportionally based on student population distribution across 12 schools

03

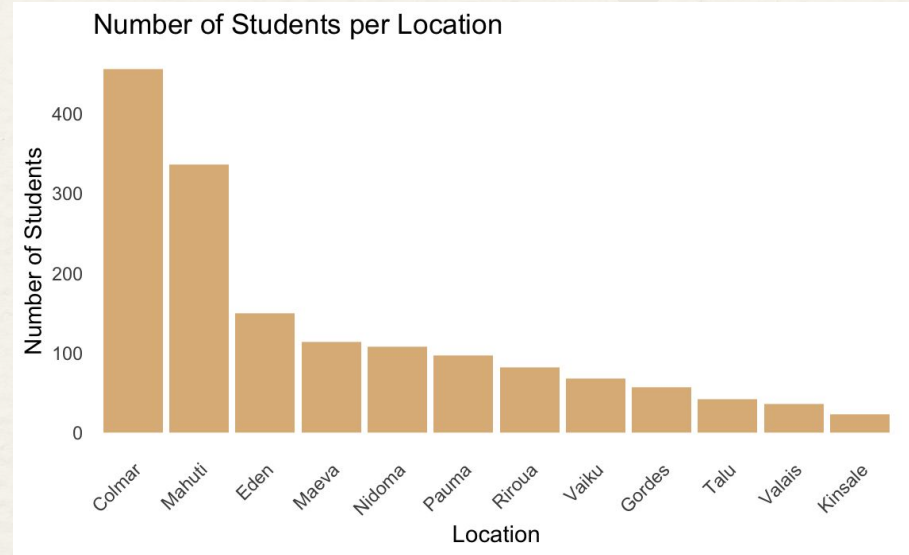
Repeat steps 1-2 for all 12 schools

- Total samples for each block: 36

04

For each student

- Measure time taken to complete memory game (before)
- Listen to assigned music genre for 10 mins
- Measure time taken to complete memory game (after)



03

Results



Analysis of Variance

```
model <- aov(Difference.in.Time ~ Music.Genre+Gender+Division, data = df)
summary(model)
```

##		Df	Sum Sq	Mean Sq	F value	Pr(>F)						
##	Music.Genre	2	13571	6785	111.930	<2e-16 ***						
##	Gender	1	3	3	0.044	0.835						
##	Division	1	14	14	0.233	0.630						
##	Residuals	139	8426	61								
##	---											
##	Signif. codes:	0	'***'	0.001	'**'	0.01	'*'	0.05	'.'	0.1	' '	1

Music Genre has **significant** effect on **memory performance** → at least one genre differs from the others
Gender and **Grade Division** are **not significant** → blocking by these factors is unnecessary

Tukey Post-Hoc Test

```
## Tukey multiple comparisons of means
## 95% family-wise confidence level
##
## Fit: aov(formula = Difference.in.Time ~ Music.Genre + Gender + Division, data = df)
##
## $Music.Genre
##              diff          lwr          upr          p adj
## Country-Classical  2.2475 -1.517717  6.012717  0.3364128
## Heavy Metal-Classical 21.6250 17.859783 25.390217 0.0000000
## Heavy Metal-Country  19.3775 15.612283 23.142717 0.0000000
##
## $Gender
##              diff          lwr          upr          p adj
## Male-Female -0.2711111 -2.83683  2.294608  0.8348151
##
## $Division
##              diff          lwr          upr          p adj
## upper-lower -0.6266667 -3.192386  1.939053  0.6299139
```

Heavy Metal significantly different from other genres

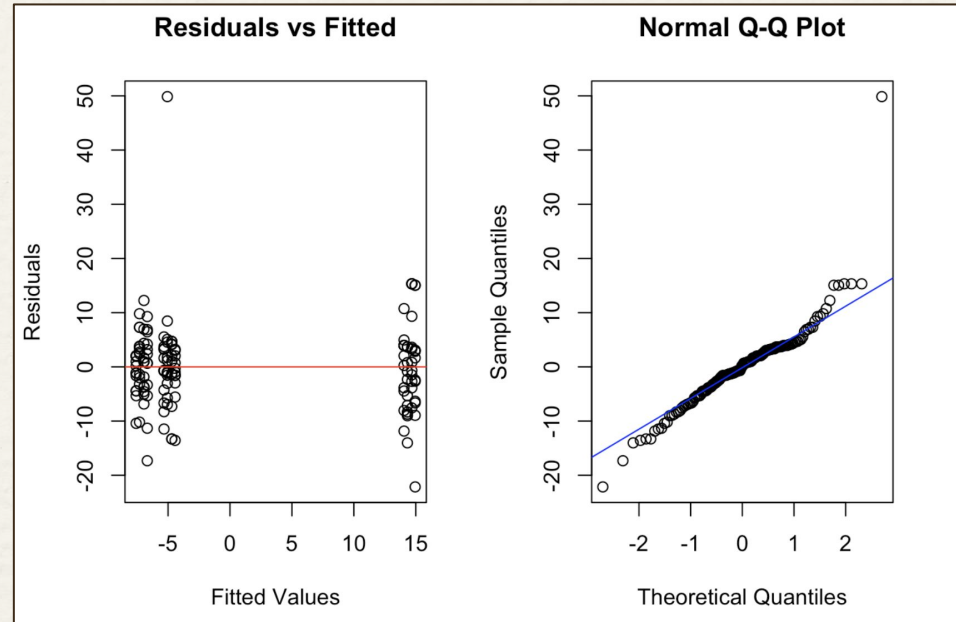
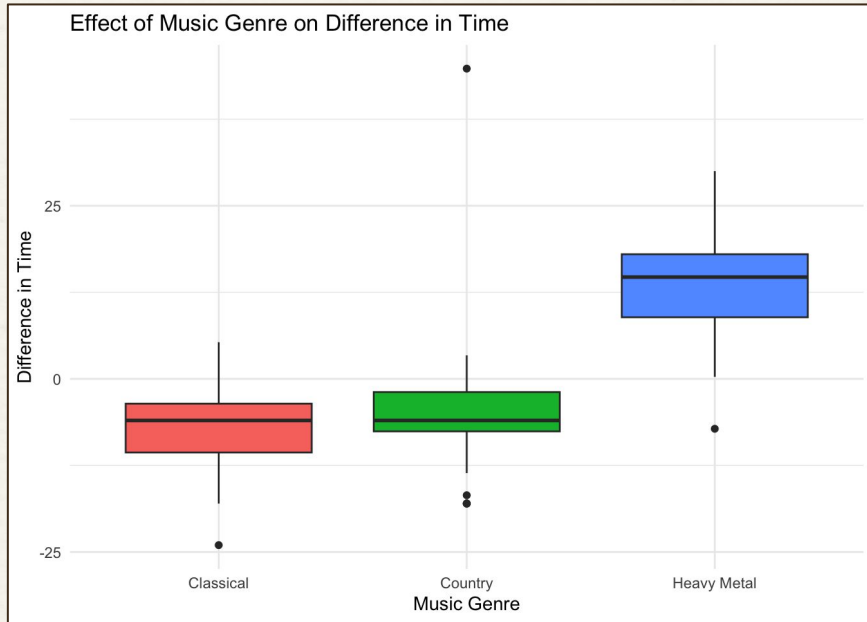
Children took **significantly longer** to complete memory task after listening to heavy metal genre

04

Discussion



Visualization and Assumption Check



Heavy metal - Significantly **worsened**
Classical and Country – Significantly **improved**

- ✓ Residuals randomly scattered around 0
- ✓ Residuals constant variance
- ✓ Residuals normally distributed

Conclusion and Implications

From our study...

- Passive listening to music will affect memory performance
- Classical and Country music significantly improves memory performance
- Heavy Metal music significantly worsens memory performance
- We know the short term effects of music, but long term effect still needs to be investigated

What does this mean?

- Schools should play Classical and Country music during recess to enhance students' learning retention
- Students should refrain from listening to Heavy Metal music when studying
- Bridge the educational gap between higher and lower-resourced communities

Scalable

Accessible

Affordable

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Thank You!

