Impact of Various Alcoholic Beverages on Memory Performance: A Latin Square Design Analysis

Zhouyi Liu, Shabib Alam
Group U

INTRODUCTION

- Alcohol consumption impacts memory performance and cognitive functions.
- The WHO reports an average consumption of 5.5 liters of pure alcohol per person aged 15 and older in 2019.
- Given the mixed findings, the specific impact of different types of alcoholic beverages and the effective time after consumption remains unclear.

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- Whether different types of alcoholic beverages—light beer, regular beer, Guinness, red wine, and white wine—have distinct effects on memory performance?

METHODS

Participants

- 125 male participants aged 21 and above.
- Recruited from a virtual platform called Island.

Design

- 5x5 Latin Square matrix.
- Randomized Latin Squares using R.
- Controlled for age and time after drinking.

1	2	3	4	5
5	1	2	3	4
4	5	1	2	3
3	4	5	1	2
2	3	4	5	1

Instruments

- Memory Card Test.
- Participants shown 10 cards and had one minute to recall.

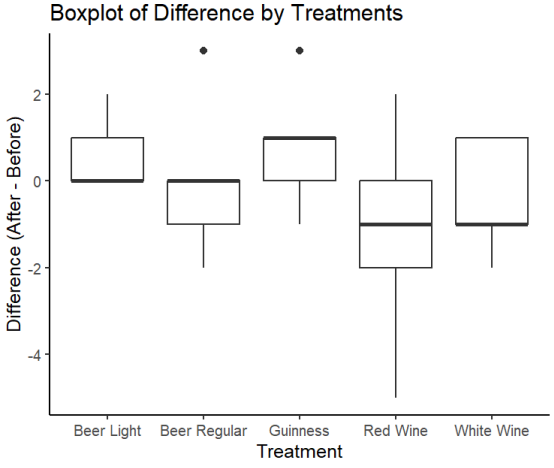
PROCEDURE

1. Recruit participants and obtain informed consent.
2. Record ages and conduct the initial Memory Card Test.
3. Randomly assign participants to time intervals.
4. Place participants into a Latin Square matrix.
5. Participants consumed 500ml of one type of drink per session.
6. Calculate the difference in memory test scores for analysis.

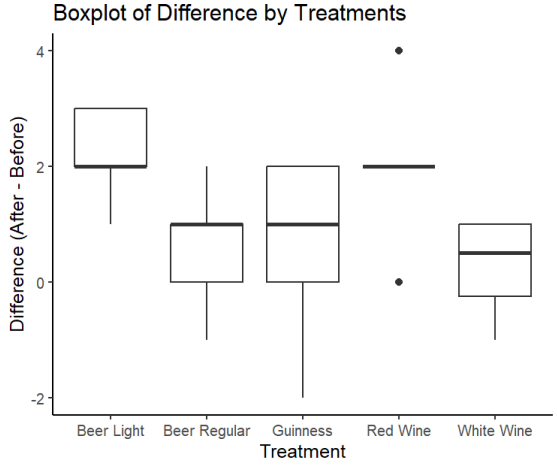
Data Analysis

- Data visualization using boxplots in R.
- Linear models fitted using lm() function.
- ANOVA performed to determine significant differences.
- Post-hoc analysis with TukeyHSD().

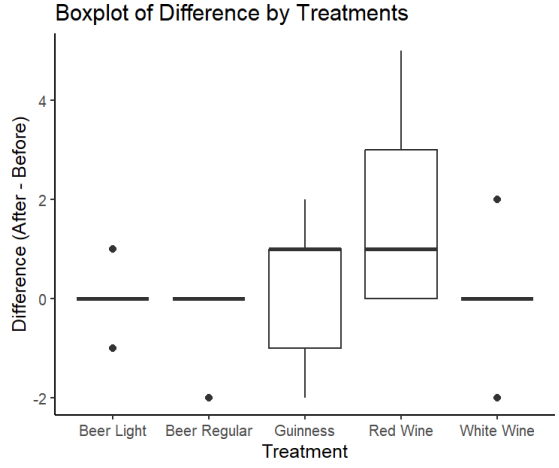
Boxplots for Latin Squares



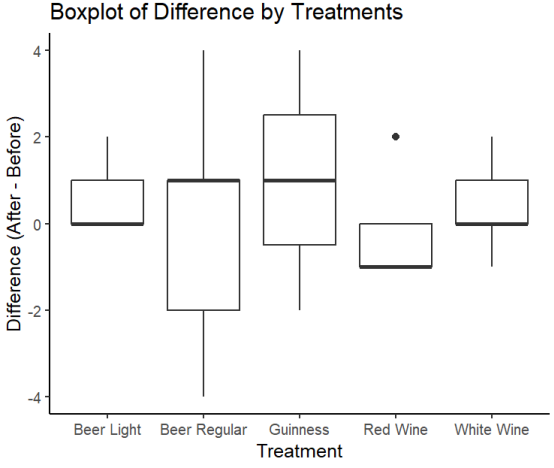
Latin Square 1



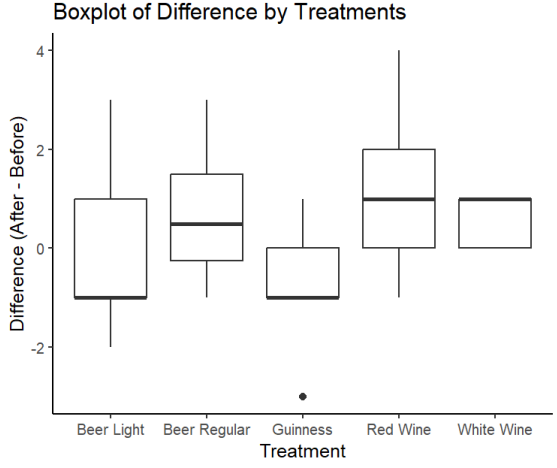
Latin Square 2



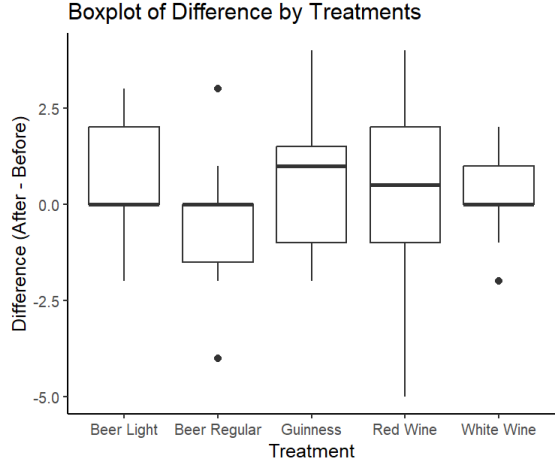
Latin Square 3



Latin Square 4

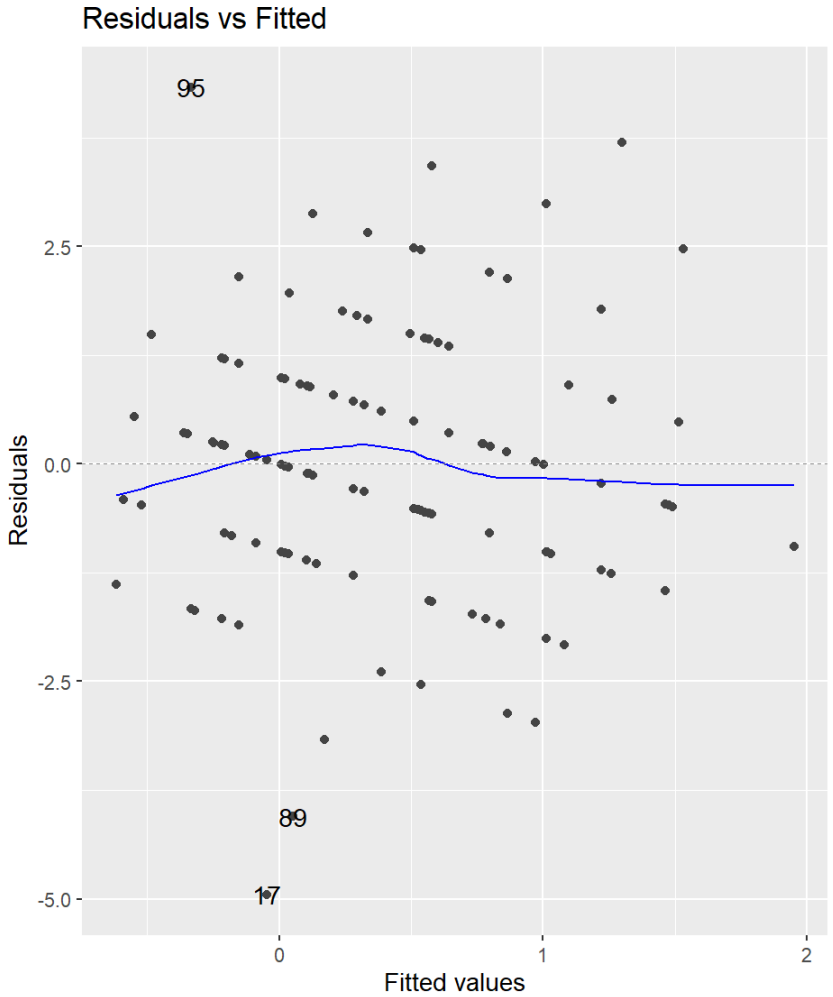


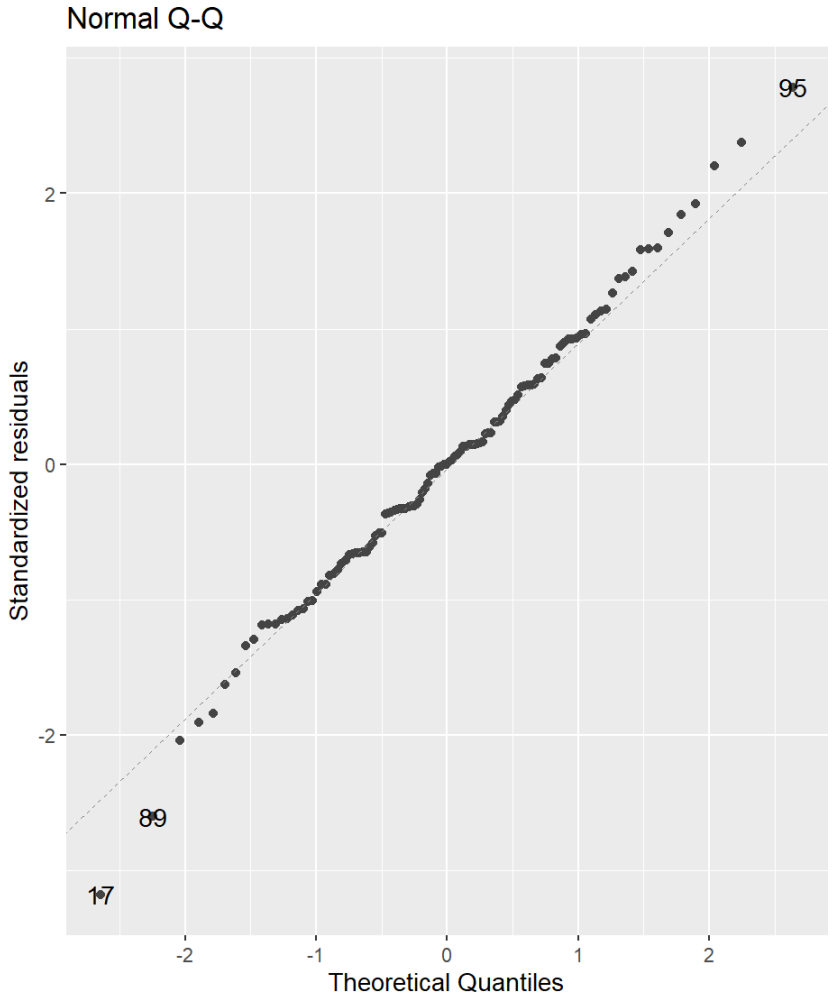
Latin Square 5



Combined Model

Diagnostic Plot





ANOVA Tables

Latin Square 1

Factor	Df	Sum Sq	F value	Pr(>F)
Age	4	26.16	6.5400	0.05708
Time	4	8.56	2.1400	0.43761
Treatment	4	12.96	3.2400	0.25322
Residual	12	25.28	2.1067	

Latin Square 2

Factor	Df	Sum Sq	F value	Pr(>F)
Age	4	5.333	1.3333	0.5851
Time	4	5.2625	1.3156	0.5809
Treatment	4	14.8708	3.7177	0.1552
Residual	11	19.8667	1.8061	

Latin Square 3

Factor	Df	Sum Sq	F value	Pr(>F)
Age	4	9.84	2.46	0.3169
Time	4	10.64	2.66	0.2832
Treatment	4	14.64	3.66	0.1638
Residual	12	22.32	1.86	

Latin Square 4

Factor	Df	Sum Sq	F value	Pr(>F)
Age	4	5.520	1.3799	0.8427
Time	4	22.754	5.6885	0.2978
Treatment	4	6.418	1.6046	0.8049
Residual	10	40.178	4.0178	

Latin Square 5

Factor	Df	Sum Sq	F value	Pr(>F)
Age	4	11.783	2.9458	0.2842
Time	4	13.150	3.2875	0.2401
Treatment	4	13.950	3.4875	0.2178
Residual	11	22.450	2.0409	

Full model

Factor	Df	Sum Sq	F value	Pr(>F)
Age	4	23.896	5.9741	0.07309
Time	4	8.406	2.1015	0.54314
Treatment	4	6.568	1.6420	0.65890
Residual	108	292.468	2.7080	

- No significant differences in memory performance across different alcoholic beverages.
- Findings imply alcohol quantity affects memory more than type.
- Future research should consider more comprehensive demographics , the complexity of drinking behavior in the real world, and additional cognitive tests.

References

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- Yang, C.C., Totzek, J.F., Lepage, M., \& Lavigne, K.M. (2023). *Sex differences in cognition and structural covariance-based morphometric connectivity: evidence from 28000+ UK Biobank*