Concentration Span Study: Insights Report

Submitted to

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Introduction

- This study investigates the factors influencing the concentration time span of individuals engaged in studying.

- The study examines three key factors: study location, study method, and social interaction, to understand their impact on concentration.

- Concentration time span plays a crucial role in academic performance and productivity, making it a valuable area of study.

- By exploring how different study environments and methods affect concentration, the research aims to provide insights into optimizing learning environments and strategies.

- Understanding these factors can have practical implications for educators, students, and individuals seeking to enhance their study habits and productivity.

Design & Data Collection Overview

Our data comprises responses (108) from diverse participants, reflecting varied study preferences and concentration spans, collected via a Google Form designed by our team. Participants reported their study location, method, social interaction, and typical duration of uninterrupted study time, contributing to the investigation on the impact of these factors on concentration span and study habits.

01. Factors and Levels:

- Study-location (A) : Home Desk(0) vs. Outdoor Location like park, terrace, café, library, garden, campus courtyard etc. (1)
- Study-method (B) : Written Notes(0) vs. Digital Notes(1)
- Social Interaction (C) : Studying Alone (0) vs. Studying with a Peer or Group (1)

02. Design Type:

- Completely Randomised Design(CRD)
- The data was analyzed using a 2^3 factorial model to examine the main effects of each factor and their interactions.

03. Data Collection:

- Manual collection method was utilized to gather responses from participants.
- The concentration time span(in minutes) served as the primary dependent variable for the study.
- Each combination of factor levels was tested multiple times to ensure the reliability and robustness of the findings.
- Repetition of experiments helps in reducing the impact of random variability and strengthens the validity of the results.

Data Collection Overview

a0b0c0	a1b0c0	a0b1c0	a1b1c0	a0b0c1	a1b0c1	a0b1c1	a1b1c1
(1)	a	b	ab	c	ac	bc	abc
120	60	120	150	50	30	240	45
30	30	60	510	120	120	75	15
90.67	120	60		30	90		
90	45	120		0.17			
90	120	120		60			
68	120	30		240			
60	90	195		120			
45	120			20			
60				30			
100				180			
60				60			
60				45			
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EXCEL SHEET LINK

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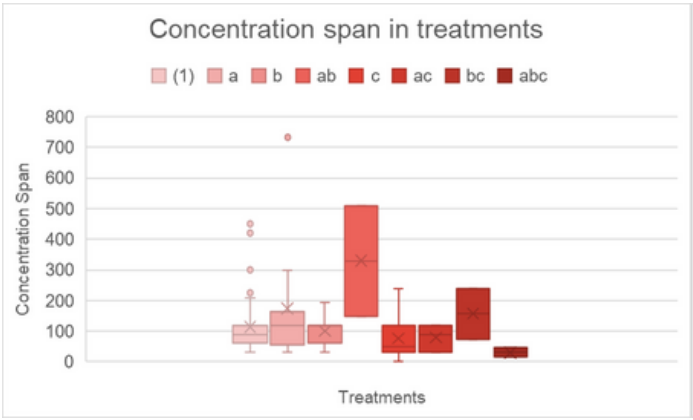
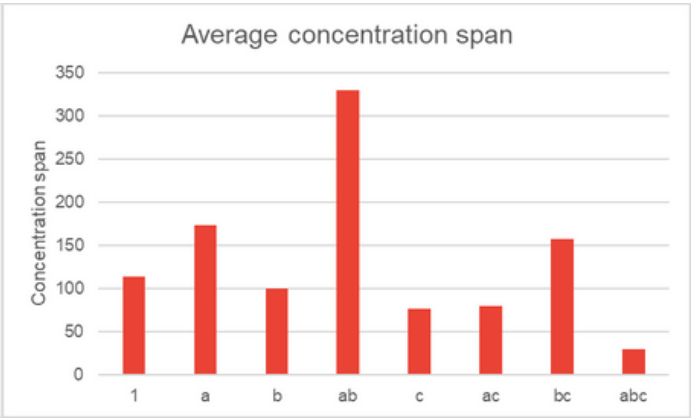
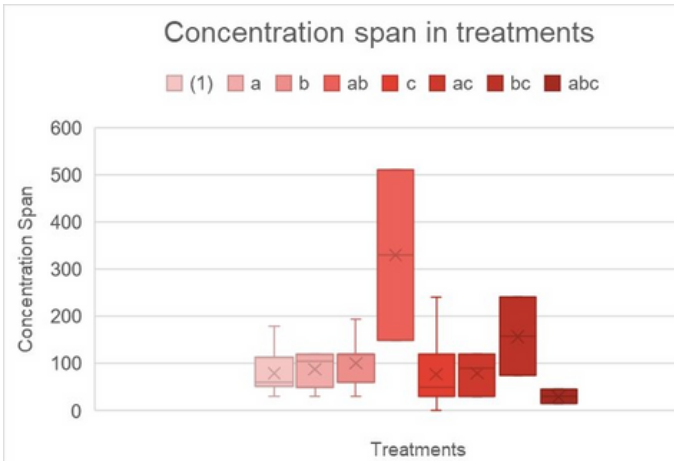
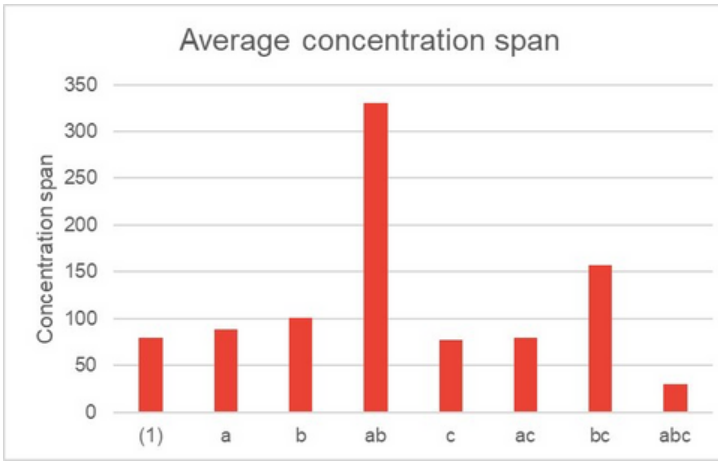
Analysis of Results





Outliers removed





Analysis of Results

Tests of Between-Subjects Effects					
Dependent Variable:	conc_span				
Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	140954.785a	7	20136.398	6.861	0.000
Intercept	404399.011	1	404399.011	137.780	0.000
study_location	5914.184	1	5914.184	2.015	0.159
study_method	39402.317	1	39402.317	13.424	0.000
social_interaction	29250.260	1	29250.260	9.966	0.002
study_location * study_method	3657.801	1	3657.801	1.246	0.267
study_location * social_interaction	59956.054	1	59956.054	20.427	0.000
study_method * social_interaction	24726.667	1	24726.667	8.424	0.005
study_location * study_method * social_interaction	56029.741	1	56029.741	19.089	0.000
Error	252420.014	86	2935.116		
Total	1106835.328	94			
Corrected Total	393374.800	93			

R Squared = .358 (Adjusted R Squared = .306)

where R square represents the proportion of variability in concentration span explained by the model- approximately 35.8% in this case
and Adjusted R square accounts for the number of predictors and sample size, providing a more accurate estimate of model fit which is 3.06.

Model equation:

$$y_{ijk} = \mu + a_i + b_j + c_k + ab_{ij} + ac_{ik} + bc_{jk} + abc_{ijk} + \epsilon_{ijk}$$

where the symbols have their usual meanings and ϵ ~ NID(0,1)

- The corrected model tests the overall significance of the factors and their interactions.
- In our case, it examines the joint effect of study location, study method, and social interaction on concentration span.
- The significant F-value (F=6.861, p<0.05) suggests that at least one of the factors or their interactions significantly affects concentration span.
- However, we need to explore further to understand which specific effects are driving this significance.

Ho : There is no significant difference due to treatments.
H1 : There is significant difference present due to treatments.

- The intercept corresponds to the baseline concentration span, which is the estimated average concentration span when participants study under standard conditions: at a home desk, using written notes, and studying alone.
- A highly significant intercept (F=137.780, p<0.05) suggests that even without considering specific study locations, methods, or social interactions, there exists a statistically significant baseline level of concentration span.

Ho: There is no significant difference in concentration span when participants study under standard conditions: at a home desk, using written notes, and studying alone (i.e., the intercept is equal to zero).
H1: There is a significant difference in concentration span when participants study under standard conditions (i.e., the intercept is not equal to zero).

Study Location:

- **The non-significant F-value (F=2.015, p=0.159) suggests that there's no strong evidence that different study locations significantly impact concentration span.**
- **Participants' concentration span doesn't seem to differ significantly between Home Desk and Outdoor Locations.**

Study Method:

- **The significant F-value (F=13.424, p<0.05) implies that the choice between Written Notes and Digital Notes significantly affect concentration span.**
- **Both methods appear to have different effects on concentration span.**

Social Interaction:

- **The significant F-value (F=9.966, p=0.002) indicates that social interaction plays a role in concentration span.**
- **Participants studying alone may have different concentration spans compared to those studying with peers or in groups.**

Ho : There is no significant difference in concentration span due to the main effects (ai, bj, ck = 0 for all i)

H1 : There is a significant difference in concentration span due to the main effects (ai, bj, ck ≠ 0 for at least one i)

Pairwise Comparison test For the Significant Main Effects

Dependent Variable:	conc_span					
(I) social_interaction		Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Differenceb	
					Lower Bound	Upper Bound
alone	peer/grp	63.356*	20.069	0.002	23.459	103.253
peer/grp	alone	-63.356*	20.069	0.002	-103.253	-23.459

Dependent Variable:	conc_span					
(I) study_method		Mean Difference (I-J)	Std. Error	Sig.b	95% Confidence Interval for Differenceb	
					Lower Bound	Upper Bound
written	digital	-73.533*	20.069	0.000	-113.430	-33.636
digital	written	73.533*	20.069	0.000	33.636	113.430

Study Method

These results suggest that there is a statistically significant difference in the mean scores of concentration span between participants who used the "written" and "digital" study methods, with those using the "digital" method scoring higher on average.

Social Interaction

These results suggest that there is a statistically significant difference in the mean scores of concentration span between participants who were "alone" and those who engaged in "peer/grp" social interaction, with the latter group scoring higher on average

Ho : There is no significant difference between the two levels of the factor.
H1: There is a significant difference between the two levels of the factor.

- Study Location * Study Method:
- The non-significant interaction (F=1.246, p=0.267) suggests that the combined effect of study location and study method is not statistically significant.
- In other words, the impact of study method doesn't vary significantly across different study locations.

- Study Location * Social Interaction:
- The significant interaction (F=20.427, p<0.05) reveals that the joint effect of study location and social interaction matters.
- Studying alone at an outdoor location might have a different impact on concentration span compared to studying alone at a home desk.

- Study Method * Social Interaction:
- The significant interaction (F=0.8424, p=0.005) suggests that the combination of study method and social interaction significantly affect concentration span.
- Whether you use written or digital notes seem to interact strongly with social context.

Ho : There is no significant interaction effect between the 2FIE on concentration span (i.e., the coefficient aibj, bjck, aick = 0).
H1 : There is a significant interaction effect between 2FIE on concentration span (i.e., the coefficient aibj, bjck, aick ≠ 0).

- Study Location * Study Method * Social Interaction:
- The significant interaction (F=19.089, p<0.05) indicates that the three factor interaction play a role.
- Study method and location and social interaction together have a significant effect in the concentration span of an individual.

Ho : There is no significant difference in concentration span due to the three factor interaction between study location, study method, and social interaction (i.e., aibjck = 0 for all values of i, j, and k).
H1: There is a significant difference in concentration span due to the three factor interaction between study location, study method, and social interaction (i.e., aibjck ≠ 0 for at least one value of i, j, or k).

Pairwise Comparison for the significant 2 factor interactions

study_location * social_interaction					
Dependent Variable:	conc_span				
study_loc		Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
home	alone	89.867	10.849	68.300	111.434
	peer/grp	117.218	20.575	76.316	158.120
outside	alone	209.063	21.415	166.490	251.635
	peer/grp	55.000	24.728	5.842	104.158

study_method * social_interaction					
Dependent Variable:	conc_span				
study_method		Mean	Std. Error	95% Confidence Interval	
				Lower Bound	Upper Bound
written	alone	83.573	10.227	63.242	103.904
	peer/grp	78.468	17.350	43.977	112.960
digital	alone	215.357	21.719	172.181	258.533
	peer/grp	93.750	27.088	39.900	147.600

Pairwise Comparison for the 3 factor interaction

study_loc * study_method * social_interaction						
Dependent Variable:	conc_span					
study_loc			Mean	Std. Error	95% Confidence Interval	
					Lower Bound	Upper Bound
home	written	alone	79.021	7.176	64.755	93.286
		peer/grp	76.936	15.026	47.066	106.807
	digital	alone	100.714	20.477	60.008	141.421
		peer/grp	157.500	38.309	81.345	233.655
outside	written	alone	88.125	19.154	50.047	126.203
		peer/grp	80.000	31.279	17.820	142.180
	digital	alone	330.000	38.309	253.845	406.155
		peer/grp	30.000	38.309	-46.155	106.155

Interpretation of Results

The analysis indicates significant main effects for study method and social interaction, as well as a significant three-way interaction effect between study location, study method, and social interaction, suggesting their combined influence on concentration span. However, it's important to note that the explained variance is relatively modest, indicating that other factors not considered in this study may also play a role in concentration span.

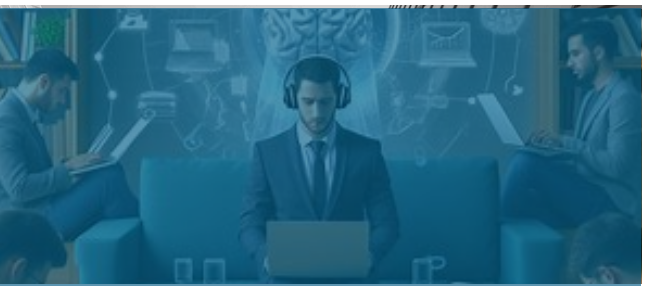
Findings & Discussion

01. Effect of Study Location:

Study location showed no significant impact on concentration span, indicating participants' consistent spans across different environments, implying adaptability to various study locations without altering concentration ability.

02. Influence of Study Method

Participants' concentration spans showed significant difference based on their preferred study method, suggesting that individuals may have different study habits based on whether they used written or digital notes.



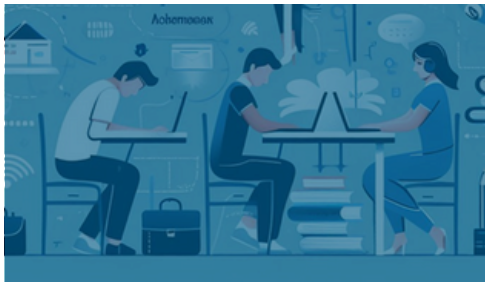
03. Impact of Social Interaction:

Social interaction significantly impacted concentration span, as participants studying with peers or in groups showed varied spans compared to those studying alone, emphasizing the benefits of collaborative study while highlighting the importance of managing distractions in social learning settings.

Conclusions

Limitations

- The study relied on self-reported data, which may be subject to biases and inaccuracies.
- The sample primarily consisted of undergraduate students, limiting the generalizability of findings to other demographics.
- Factors not accounted for in the study, such as noise levels and personal preferences, could influence concentration span.
- The sample size and diversity could be expanded to enhance the generalizability of the findings



Recomendation for further research

Future research should longitudinally examine the evolution of concentration span and study habits, while also considering factors like ambient noise, task complexity, and cultural influences to provide a comprehensive understanding of concentration dynamics.

Future Directions

For this study, future directions include exploring personalized study interventions, advanced data analytics, and collaborative research to optimize study habits and concentration span.

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References:

1) Montgomery, D. C. (2008). Design and Analysis of Experiments. John Wiley.
2) Das., M.N. and Giri, N.C. (1986). Design and Analysis of Experiments. Wiley Eastern
3) Class Notes (Dr.Vandana Sarin Walia)
4) Experimental Designs and their Analysis (Dr.Shalabh-IITK)