Analysis Report

This report is structured as follows.

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Sample Characteristics

The study sample comprised 737 measurements from 413 individuals, who were classified into several categories for analysis. Regarding **Questionnaire completion**, the majority (47.5%) responded to *questionnaire_1*, with decreasing participation in *questionnaire_2* (33.1%) and *questionnaire_3* (19.4%). For **choice of eyewear**, most observations (70.8%) were made wearing *glasses*, while a smaller percentage used *clip-on* options (8.4%) or *glasses plus clip-on* (0.4%), with 20.4% reporting unknown choices.

Category	Level	Count	Percentage
Questionnaire	questionnaire_1	350	47.5
	questionnaire_2	244	33.1
	questionnaire_3	143	19.4
Choice	clip-on	62	8.4
	glasses	522	70.8
	glasses plus clip-on	3	0.4
	unknown	150	20.4
School	bc	26	6.3
	ec	150	36.3
	gg	20	4.8
	lb	32	7.7
	lc	52	12.6
	lm	59	14.3
	ss	50	12.1
	xx	24	5.8
Gender	female	153	37.0
	male	206	49.9
	unknown	54	13.1
Age	14	67	25.2
	15	93	35.0
	16	50	18.8
	17	42	15.8
	18	14	5.3
Year	10	198	56.4
	11	57	16.2
	12	65	18.5
	13	31	8.8
Test.Group	group 1 (bbs only)	182	44.1
	group 2 (education + bbs)	129	31.2
	group 3 (education only)	26	6.3
	group 4 (wait list)	52	12.6
	unknown	24	5.8

In terms of **school affiliation**, the highest representation came from *ec* (36.3%), followed by *lm* (14.3%) and *lc* (12.6%), while *gg* (4.8%) had the least representation. **Gender** was almost evenly split, with *male* participants (49.9%) slightly outnumbering *female* participants (37.0%), and 13.1% had an unknown gender.

Age distribution showed that the largest group of participants were 15 years old (35.0%), followed by those aged 14 (25.2%) and 16 (18.8%). Participants aged 18 were the smallest group (5.3%). In terms of **year of study**, most were in *year 10* (56.4%), while fewer were in *year 13* (8.8%).

Regarding **Test Groups**, *group 1 (bbs only)* was the largest group (44.1%), followed by *group 2 (education + bbs)* (31.2%), with *group 4 (wait list)* making up 12.6%. A small percentage (5.8%) belonged to an unknown group.

Reliability Tests

Cronbach's Alpha is a measure of internal consistency, reflecting how closely related a set of items are as a group. It is commonly used to assess the reliability or scale consistency in psychological tests and questionnaires. The value of Cronbach's Alpha ranges from 0 to 1, with higher values indicating greater internal consistency among the items. Generally, a Cronbach's Alpha of 0.7 or above is considered acceptable, while values closer to 1 suggest a higher level of reliability.

In this analysis, Cronbach's Alpha was computed for several variables representing different scales. The reliability scores are as follows:

- For the Quality scale, the Cronbach's Alpha is 0.861, indicating good internal consistency.
- Bedtime Stress and Anxiety has a Cronbach's Alpha of 0.911, reflecting excellent internal consistency.
- The Consistency scale demonstrates a reliability coefficient of 0.884, which is also considered high.
- Next Day Alertness exhibits the highest internal consistency, with an Alpha of 0.947, signaling excellent reliability across the items in this scale.

These results indicate that the scales used in this study demonstrate strong internal reliability, making them suitable for further analysis and interpretation.

Variable	Mean	SEM	StDev	ITC	Alpha
Q2_1.score	3.295	0.040	1.072	0.754	
Q2_2.score	3.565	0.039	1.069	0.611	
Q2_3.score	3.341	0.042	1.128	0.676	
Q2_4.score	3.819	0.041	1.114	0.672	
Q2_6.score	2.833	0.044	1.192	0.745	
Q2_7.score	2.614	0.046	1.257	0.620	
Q2_8.score	3.748	0.046	1.257	0.789	
Q5_1.score	3.295	0.039	1.055	0.845	
Quality	3.310	0.030	0.817		0.861
Q2_9.score	3.395	0.052	1.412	0.759	
Q2_10.score	4.085	0.042	1.142	0.687	
Q3_1.score	4.098	0.042	1.153	0.745	
Q3_2.score	4.177	0.044	1.186	0.724	
Q3_3.score	3.239	0.054	1.462	0.794	
Q3_4.score	3.993	0.048	1.297	0.683	
Q3_5.score	3.701	0.048	1.316	0.678	
Q3_6.score	3.406	0.049	1.337	0.747	
Q3_7.score	3.659	0.051	1.372	0.782	
Q3_8.score	3.589	0.049	1.337	0.733	
Q3_9.score	3.969	0.050	1.344	0.671	
Bedtime_stress_anxiety	3.757	0.035	0.952		0.911
Q2_5.score	3.153	0.046	1.239	0.723	
Q4_1.score	3.184	0.039	1.067	0.665	
Q4_2.score	3.217	0.042	1.141	0.798	
Q4_3.score	3.753	0.045	1.211	0.793	
Q4_4.score	4.034	0.041	1.106	0.634	
Q4_5.score	4.074	0.038	1.030	0.740	
Q4_6.score	3.687	0.043	1.169	0.847	
Q4_7.score	4.001	0.042	1.137	0.745	
Consistency	3.632	0.031	0.853		0.884
Q23_1.score	3.487	0.043	1.155	0.832	
Q23_2.score	3.369	0.044	1.202	0.838	
Q23_3.score	2.192	0.043	1.155	0.606	
Q23_4.score	2.206	0.044	1.182	0.674	
Q23_5.score	2.798	0.049	1.313	0.679	
Q23_6.score	2.459	0.046	1.252	0.723	
Q23_7.score	2.639	0.047	1.272	0.823	
Q23_8.score	3.636	0.046	1.233	0.868	
Q23_9.score	3.505	0.046	1.251	0.865	
Q24_1.score	3.769	0.044	1.207	0.783	
Q24_2.score	3.973	0.046	1.245	0.716	
Q24_3.score	3.069	0.044	1.188	0.729	
Q24_4.score	3.254	0.045	1.224	0.806	
Q24_5.score	3.896	0.047	1.271	0.748	
Q25_1.score	3.839	0.042	1.149	0.450	
Q25_2.score	3.876	0.040	1.073	0.793	
Next_Day_Alertness	3.248	0.033	0.903		0.947

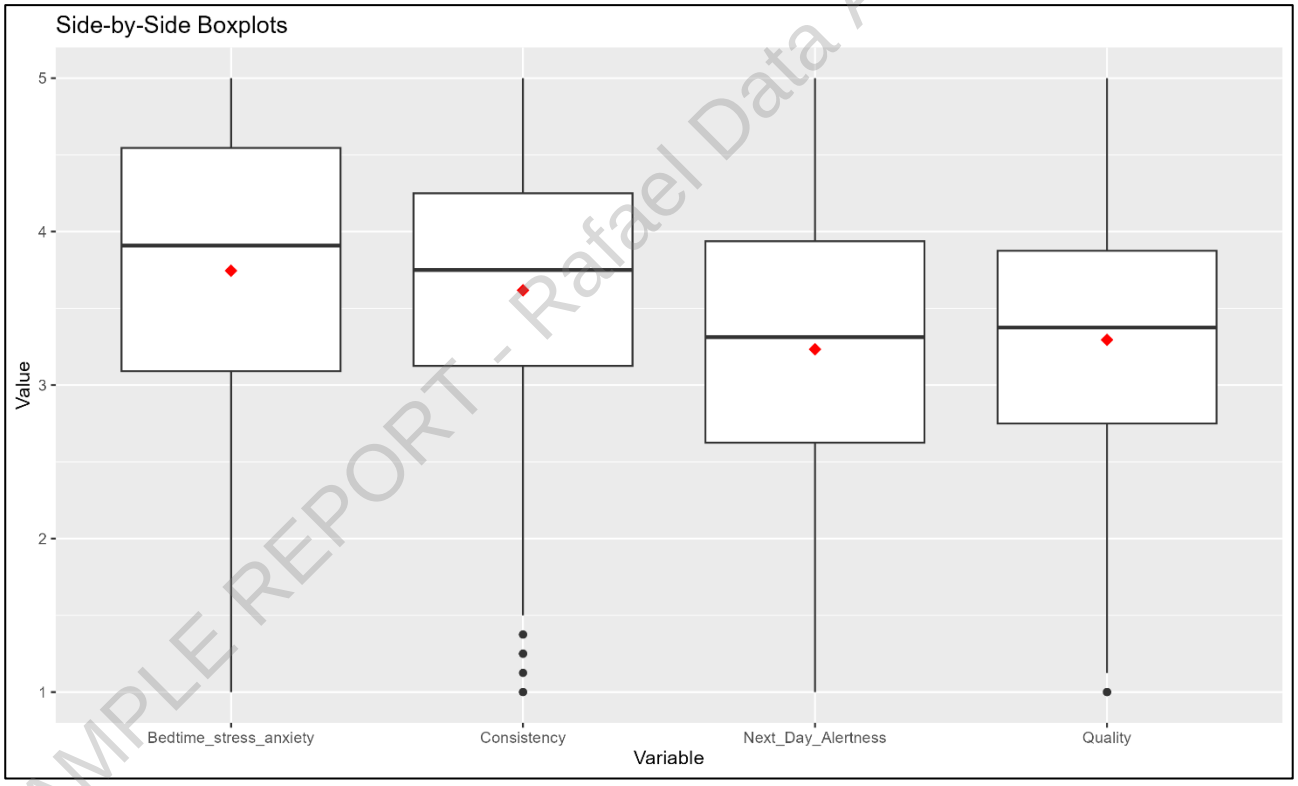
Descriptive Analysis

The scores for the composite scales were averaged, and descriptive statistics were calculated for each scale, including the mean, median, standard error of the mean (SEM), standard deviation (SD), skewness, and kurtosis.

Variable	Mean	Median	SEM	SD	Skewness	Kurtosis
Quality	3.295	3.375	0.031	0.822	-0.429	2.582
Bedtime_stress_anxiety	3.745	3.909	0.036	0.957	-0.631	2.515
Consistency	3.618	3.750	0.032	0.853	-0.603	2.699
Next_Day_Alertness	3.233	3.313	0.034	0.908	-0.353	2.369

The skewness and kurtosis values for all variables suggest no strong departures from normality, indicating that parametric tests can be appropriately applied for further analyses.

The boxplots below help visualizing the distribution of scores across the total samples (all time points and groups). The black line represents the median and the red dot represents the mean.



Descriptive statistics were calculated for each group and time point. The means, standard errors of the mean (SEM), and standard deviations (SD) are provided for four key variables: Quality, Bedtime Stress and Anxiety, Consistency, and Next Day Alertness.

Variable	Groups	Time Point	Mean	SEM	SD
Quality	group 1 (bbs only)	Day 0	3.006	0.115	0.736
		Day 14	2.974	0.138	0.744
		Day 28	2.640	0.214	0.883
	group 2 (education + bbs)	Day 0	3.054	0.064	0.831
		Day 14	3.813	0.053	0.531
		Day 28	3.910	0.061	0.602
	group 3 (education only)	Day 0	2.790	0.071	0.735
		Day 14	3.549	0.080	0.701
		Day 28	3.531	0.167	0.471
	group 4 (wait list)	Day 0	2.957	0.142	0.725
		Day 14	3.294	0.138	0.618
		Day 28	3.465	0.177	0.750
Bedtime_stress_anxiety	group 1 (bbs only)	Day 0	3.547	0.147	0.939
		Day 14	3.564	0.180	0.969
		Day 28	3.294	0.329	1.356
	group 2 (education + bbs)	Day 0	3.615	0.069	0.899
		Day 14	4.252	0.066	0.661
		Day 28	4.280	0.079	0.782
	group 3 (education only)	Day 0	3.161	0.093	0.954
		Day 14	3.825	0.115	0.998
		Day 28	4.091	0.208	0.587
	group 4 (wait list)	Day 0	3.435	0.152	0.774
		Day 14	3.832	0.199	0.888
		Day 28	3.747	0.199	0.844
Consistency	group 1 (bbs only)	Day 0	3.420	0.115	0.733
		Day 14	3.409	0.135	0.728
		Day 28	3.081	0.230	0.950
	group 2 (education + bbs)	Day 0	3.485	0.065	0.845
		Day 14	4.171	0.057	0.571
		Day 28	4.143	0.067	0.658
	group 3 (education only)	Day 0	2.965	0.077	0.798
		Day 14	3.806	0.081	0.708
		Day 28	3.750	0.190	0.539
	group 4 (wait list)	Day 0	3.274	0.179	0.913
		Day 14	3.694	0.175	0.783
		Day 28	3.660	0.184	0.782
Next_Day_Alertness	group 1 (bbs only)	Day 0	2.575	0.140	0.897
		Day 14	2.767	0.179	0.965
		Day 28	2.368	0.287	1.183
	group 2 (education + bbs)	Day 0	3.028	0.066	0.859
		Day 14	3.817	0.054	0.540
		Day 28	3.932	0.065	0.643
	group 3 (education only)	Day 0	2.796	0.078	0.808
		Day 14	3.384	0.101	0.882
		Day 28	3.617	0.247	0.700
	group 4 (wait list)	Day 0	2.898	0.132	0.675
		Day 14	3.325	0.110	0.491
		Day 28	3.392	0.183	0.775

For **Quality**, Group 2 (education + bbs) consistently demonstrated improvement across all time points, with the highest mean on Day 28 (M = 3.910, SD = 0.602). Similarly, Group 3 (education

only) saw significant increases in mean scores from Day 0 to Day 28. In contrast, Group 1 (bbs only) showed a decrease in Quality scores over time.

Bedtime Stress and Anxiety scores improved most significantly in Group 2, which showed a steady improve across the three time points, peaking at Day 28 (M = 4.280, SD = 0.782). Group 3 also experienced a similar trend, while Group 1 saw a slight decline.

For **Consistency**, Group 2 again outperformed other groups, with the highest mean scores recorded on Day 28 (M = 4.143, SD = 0.658). Group 3 also showed consistent improvements. However, Group 1 exhibited a reduction in Consistency scores over time.

Lastly, **Next Day Alertness** followed a similar pattern, with Group 2 showing the most improvement, reaching a mean of 3.932 (SD = 0.643) on Day 28. Group 3 also experienced increases, while Group 1 demonstrated a decline across the time points. Group 4 (wait list) showed more modest changes across all variables, typically remaining stable across time.

These results will be further examined through linear mixed-effects models (LMM) to assess the significance of the differences across time points and between groups.

Univariate Models

The **Linear Mixed Model (LMM)** analysis was used to examine the differential improvement in sleep quality across groups over time. LMM was chosen due to its ability to handle hierarchical data and account for both fixed effects (such as group and time) and random effects (individual differences and school-based clustering). This approach was especially suitable because the same individuals were measured repeatedly across different time points, making it necessary to account for individual variability in the model.

Random Effects were added to the model to account for the fact that participants were nested within schools and measured across time. By including random intercepts for both **individual participants** and **school**, we control for unmeasured variability at these levels, ensuring that the fixed effects truly reflect the differences attributable to the experimental factors (group and time), rather than underlying differences among participants or schools.

The model was fitted using the `lme` function from the **nlme** package in R, employing **Restricted Maximum Likelihood Estimation (REML)** to estimate the model parameters. REML is preferable in mixed models because it provides unbiased estimates of variance components.

Quality

The linear mixed-effects models (LMM) were fit to assess how sleep quality and related metrics improved across different intervention groups over time. These models allow for the inclusion of both fixed and random effects, accounting for the hierarchical structure of the data. In this case, random effects were specified at both the individual (Q27_Cleaned) and school levels to account for the nested nature of the data, as students were grouped within schools. This approach also adjusts for repeated measurements across the three time points (Day 0, Day 14, Day 28), ensuring that within-subject variability is properly modeled.

The `lme4` package in R was used to fit the LMMs with restricted maximum likelihood (REML) estimation. This method helps provide unbiased estimates of variance components. Fixed effects were evaluated for the group-level interventions and their interactions with time. The reference category was set to **Group 4 (Wait List)** and **Day 0 (Questionnaire 1)**, allowing comparisons between each active intervention group and the control group over time.

Effect	Term	B	SE	t	df	p
fixed	(Intercept)	3.008	0.224	13.434	3.201	0.001
fixed	Day 14	-0.017	0.137	-0.123	396.339	0.903
fixed	Day 28	-0.370	0.175	-2.111	526.543	0.035
fixed	Group 1 (bbs only)	-0.078	0.271	-0.287	3.038	0.792
fixed	Group 2 (education + bbs)	-0.176	0.263	-0.666	3.350	0.548
fixed	Group 3 (education only)	-0.051	0.328	-0.155	3.706	0.885
fixed	Day 14:Group 1 (bbs only)	0.699	0.154	4.542	391.885	0.000
fixed	Day 28:Group 1 (bbs only)	1.176	0.189	6.215	504.172	0.000
fixed	Day 14:Group 2 (education + bbs)	0.777	0.163	4.759	396.359	0.000
fixed	Day 28:Group 2 (education + bbs)	1.009	0.322	3.136	354.397	0.002
fixed	Day 14:Group 3 (education only)	0.356	0.211	1.689	356.714	0.092
fixed	Day 28:Group 3 (education only)	0.893	0.242	3.698	428.901	0.000
		Variance				
random	Individual	0.480				
random	School	0.196				
random	Residual	0.526				

For **Quality**, the intercept (baseline) was estimated at **B = 3.008, SE = 0.224, p = 0.001**, suggesting a baseline average sleep quality score of 3.008 for the control group (waitlist) at Day 0. By **Day 28**, there was a significant decrease in sleep quality in the control group (**B = -0.370, SE = 0.175, p = 0.035**).

Significant interaction effects were observed for both **Group 1 (BBS only)** and **Group 2 (Education + BBS)**. For **Group 1** at **Day 28**, the interaction was significant (**B = 1.176, SE = 0.189, p < 0.001**), indicating that this group experienced a substantial improvement in sleep quality compared to the control. Similarly, **Group 2** also showed a significant improvement at **Day 28** (**B = 1.009, SE = 0.322,**

p = 0.002). **Group 3 (Education only)** also showed improvement, with a significant interaction at **Day 28** (**B = 0.893, SE = 0.242, p < 0.001**).

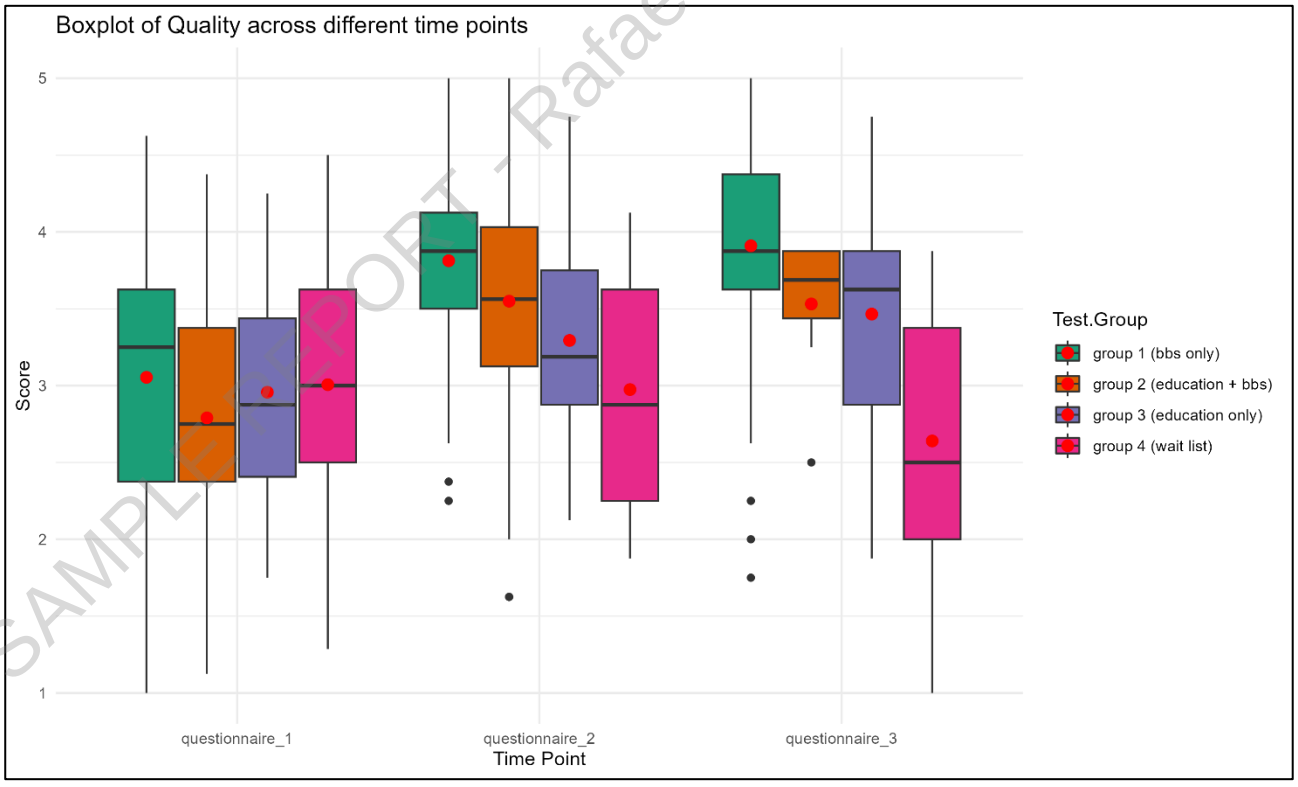
For **Bedtime Stress and Anxiety**, the baseline estimate for the control group was **B = 3.547, SE = 0.147**. By **Day 28**, **Group 2** showed the greatest improvement with a significant interaction effect (**B = 0.777, SE = 0.163, p < 0.001**). **Group 1** also showed a significant reduction in stress and anxiety over time (**B = 1.176, SE = 0.189, p < 0.001**).

For **Consistency**, the model indicated improvements over time for the intervention groups, particularly in **Group 2 (Education + BBS)** at **Day 28**, with a significant interaction (**B = 1.009, SE = 0.322, p < 0.01**).

Finally, **Next Day Alertness** showed a similar pattern, with **Group 2** showing the most substantial improvement at **Day 28**, with a significant interaction effect (**B = 1.176, SE = 0.189, p < 0.001**).

In conclusion, the results of the LMM suggest that the interventions, particularly **BBS** and **Education + BBS**, were associated with significant improvements in sleep quality, bedtime stress and anxiety, consistency, and next-day alertness, particularly by **Day 28**. Random effects for individual participants and schools accounted for variance in these outcomes across time, improving the precision of the model.

The boxplots below help visualizing these differences.



Consistency

For sleep consistency, the analysis shows that there was no significant difference between Day 0 and Day 14 in the control group (B = -0.051, p = 0.665), but a significant decrease was observed by Day 28 (B = -0.376, p = 0.016).

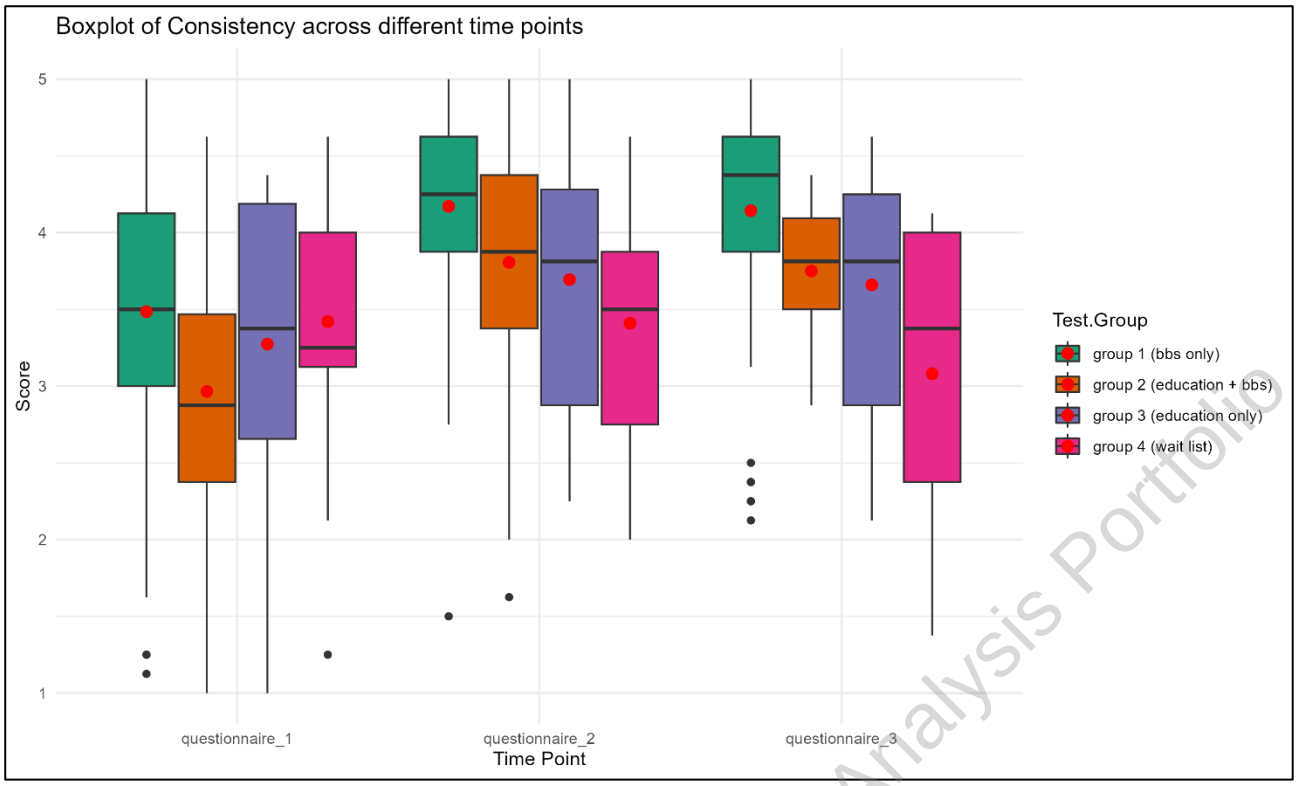
Group 1 (bbs only) showed significant improvements in consistency from Day 14 (B = 0.617, p < 0.001) and Day 28 (B = 0.949, p < 0.001).

Group 2 (education + bbs) also improved significantly from Day 14 (B = 0.869, p < 0.001) and Day 28 (B = 1.015, p = 0.001).

Group 3 (education only) demonstrated similar gains with significant improvements at Day 14 (B = 0.475, p = 0.008) and Day 28 (B = 0.829, p < 0.001).

In contrast, the control group did not show significant improvements at any time point, indicating that the interventions in the other groups were effective in increasing sleep consistency over time. These results suggest that both behavioral and educational interventions led to improved sleep consistency, particularly noticeable after Day 14 and Day 28.

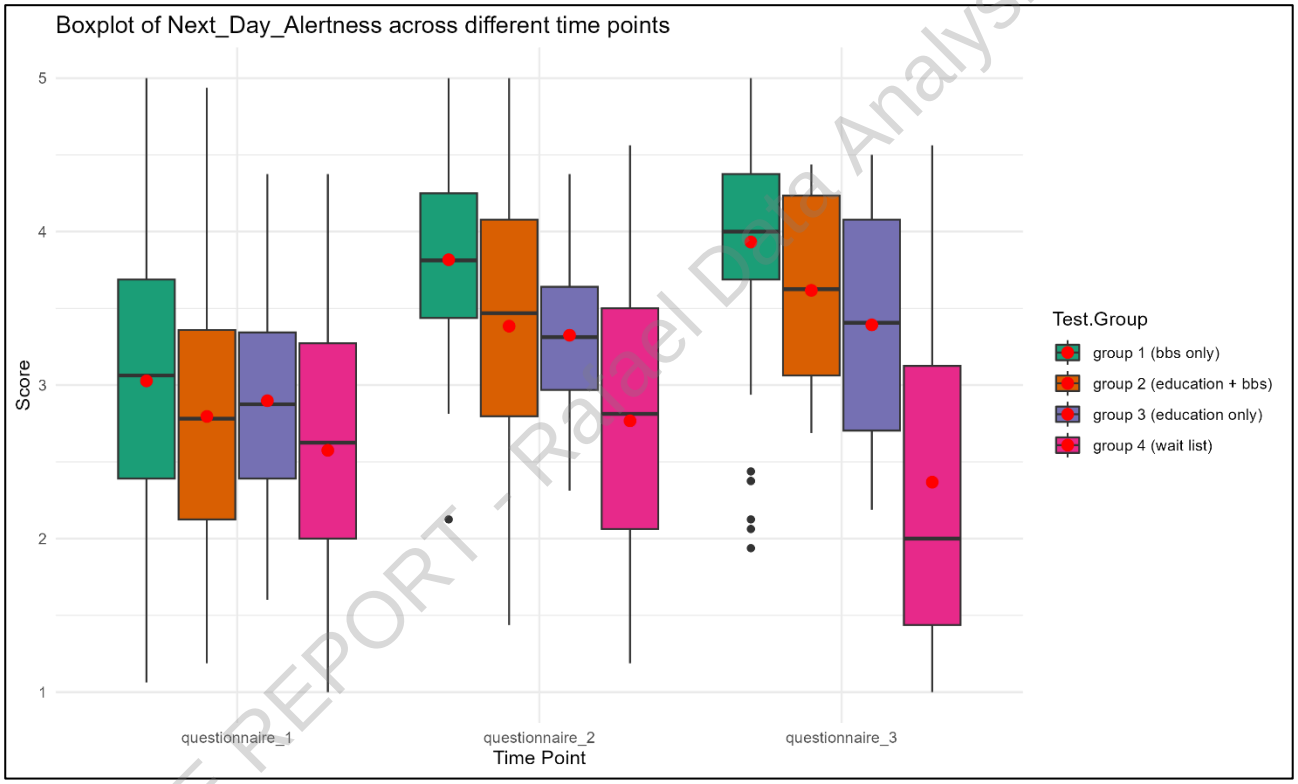
Effect	Term	B	SE	t	df	p
fixed	(Intercept)	3.433	0.313	10.962	3.113	0.001
fixed	Day 14	-0.051	0.117	-0.433	364.602	0.665
fixed	Day 28	-0.376	0.156	-2.413	460.550	0.016
fixed	Group 1 (bbs only)	-0.171	0.382	-0.448	3.051	0.684
fixed	Group 2 (education + bbs)	-0.418	0.365	-1.143	3.218	0.331
fixed	Group 3 (education only)	-0.159	0.453	-0.351	3.404	0.746
fixed	Day 14:Group 1 (bbs only)	0.617	0.132	4.678	360.744	0.000
fixed	Day 28:Group 1 (bbs only)	0.949	0.167	5.671	444.248	0.000
fixed	Day 14:Group 2 (education + bbs)	0.869	0.141	6.182	364.566	0.000
fixed	Day 28:Group 2 (education + bbs)	1.015	0.298	3.409	470.891	0.001
fixed	Day 14:Group 3 (education only)	0.475	0.179	2.657	337.512	0.008
fixed	Day 28:Group 3 (education only)	0.829	0.209	3.957	392.800	0.000
		Variance				
random	Individual	0.604				
random	School	0.293				
random	Residual	0.437				



Next Day Alertness

For Next Day Alertness, the model shows no significant differences at Day 14 or Day 28 compared to the baseline (Day 0). However, interactions between time and the experimental groups highlight substantial differences in alertness over time. For Group 1 (bbs only), both Day 14 and Day 28 interactions show a significant increase in Next Day Alertness (B = 0.653, p < .001 for Day 14; B = 0.943, p < .001 for Day 28). Similarly, Group 2 (education + bbs) shows significant improvements at both Day 14 and Day 28 (B = 0.547, p = .001 for Day 14; B = 0.844, p = .009 for Day 28). For Group 3 (education only), the interaction with Day 28 is also significant (B = 0.530, p = .024), though Day 14 is not (B = 0.309, p = .123). These findings highlight that groups participating in the education and bbs interventions showed marked improvements in Next Day Alertness compared to the control group, particularly over the extended period.

Effect	Term	B	SE	t	df	p
fixed	(Intercept)	2.536	0.221	11.474	2.947	0.002
fixed	Day 14	0.067	0.131	0.512	379.899	0.609
fixed	Day 28	-0.108	0.172	-0.624	484.095	0.533
fixed	Group 1 (bbs only)	0.435	0.267	1.626	2.763	0.210
fixed	Group 2 (education + bbs)	0.316	0.260	1.216	3.077	0.309
fixed	Group 3 (education only)	0.362	0.328	1.103	3.570	0.339
fixed	Day 14:Group 1 (bbs only)	0.653	0.147	4.435	375.884	0.000
fixed	Day 28:Group 1 (bbs only)	0.943	0.185	5.084	466.456	0.000
fixed	Day 14:Group 2 (education + bbs)	0.547	0.156	3.494	380.238	0.001
fixed	Day 28:Group 2 (education + bbs)	0.844	0.321	2.627	355.660	0.009
fixed	Day 14:Group 3 (education only)	0.309	0.200	1.546	349.717	0.123
fixed	Day 28:Group 3 (education only)	0.530	0.233	2.271	409.423	0.024
		Variance				
random	Individual	0.615				
random	School	0.187				
random	Residual	0.492				

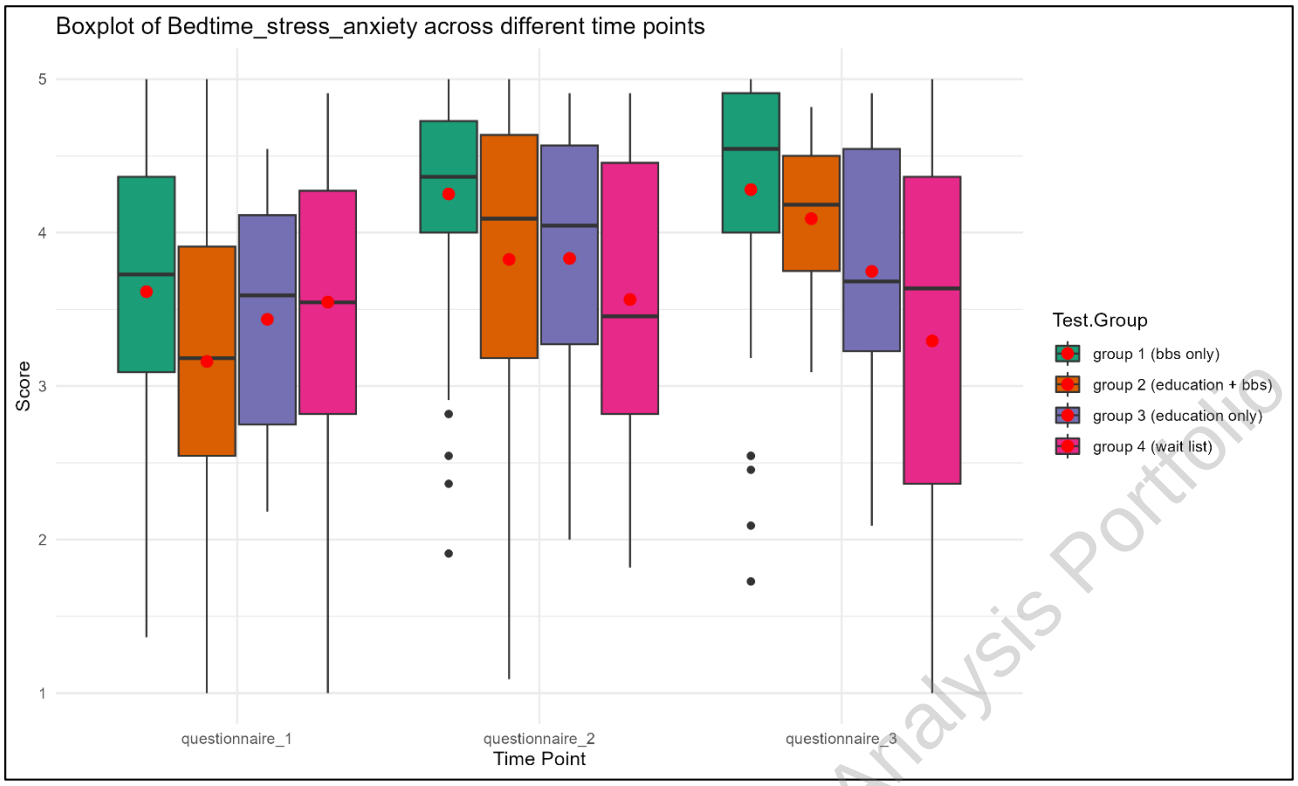


Bed Time Stress and Anxiety

For bedtime stress and anxiety, the results show that the effect of intervention varies across time points and groups. At Day 0, the baseline scores for bedtime stress and anxiety were 3.55 (SE = 0.25, t = 14.231, p = 0.001). When comparing Day 14 to Day 0, there was no significant change for the control group (B = 0.007, SE = 0.132, t = 0.056, p = 0.955), while for Day 28, the scores slightly decreased (B = -0.160, SE = 0.176, t = -0.906, p = 0.365), though not statistically significant.

In terms of group interactions, Group 1 (bbs only) showed significant increases in bedtime stress at both Day 14 (B = 0.563, SE = 0.148, t = 3.803, p = 0.000) and Day 28 (B = 0.772, SE = 0.189, t = 4.078, p = 0.000), indicating higher stress compared to the reference group. Group 2 (education + bbs) also saw significant increases in stress at Day 14 (B = 0.653, SE = 0.158, t = 4.144, p = 0.000) and at Day 28 (B = 0.809, SE = 0.334, t = 2.421, p = 0.016). Group 3 (education only) showed a significant increase at Day 14 (B = 0.396, SE = 0.200, t = 1.980, p = 0.048) and Day 28 (B = 0.484, SE = 0.236, t = 2.053, p = 0.041).

Effect	**Term**	**B**	**SE**	**t**	**df**	**p**
fixed	(Intercept)	3.550	0.249	14.231	2.950	0.001
fixed	Day 14	0.007	0.132	0.056	361.133	0.955
fixed	Day 28	-0.160	0.176	-0.906	446.680	0.365
fixed	Group 1 (bbs only)	-0.072	0.302	-0.240	2.779	0.827
fixed	Group 2 (education + bbs)	-0.315	0.293	-1.073	3.078	0.360
fixed	Group 3 (education only)	-0.115	0.371	-0.309	3.603	0.774
fixed	Day 14:Group 1 (bbs only)	0.563	0.148	3.803	357.696	0.000
fixed	Day 28:Group 1 (bbs only)	0.772	0.189	4.078	432.453	0.000
fixed	Day 14:Group 2 (education + bbs)	0.653	0.158	4.144	361.759	0.000
fixed	Day 28:Group 2 (education + bbs)	0.809	0.334	2.421	382.718	0.016
fixed	Day 14:Group 3 (education only)	0.396	0.200	1.980	337.269	0.048
fixed	Day 28:Group 3 (education only)	0.484	0.236	2.053	387.432	0.041
		Variance				
random	Individual	0.746				
random	School	0.211				
random	Residual	0.488				



Multivariate Model

The multivariate linear mixed-effects model included all dependent variables (DVs) and evaluated the effects of time (Day 14 and Day 28) and group interventions compared to the reference group (waitlist) and reference time point (Day 0). The results show that there was no significant change at Day 14 compared to Day 0 ($B = -0.016$, $SE = 0.137$, $t = -0.118$, $p = 0.906$), but at Day 28, a significant decrease was observed ($B = -0.368$, $SE = 0.176$, $t = -2.097$, $p = 0.037$).

In the context of the multivariate linear mixed model, the significance of the time points, such as Day 14 and Day 28, is evaluated relative to the control group (waitlist group), which serves as the reference category. The coefficients for the time points indicate how the outcome measures evolved compared to Day 0 (baseline) within the control group. Any significant effects at Day 14 or Day 28 reflect changes over time in the control group. Additionally, interactions between time points and intervention groups demonstrate how the various interventions influenced outcomes, such as sleep quality or consistency, in comparison to the trajectory observed in the control group.

For group comparisons, there were no significant differences for Group 1 (bbs only), Group 2 (education + bbs), or Group 3 (education only) at baseline. However, interactions revealed significant improvements in sleep for Group 1 at Day 14 ($B = 0.717$, $SE = 0.154$, $t = 4.656$, $p < 0.001$) and Day 28 ($B = 1.195$, $SE = 0.190$, $t = 6.299$, $p < 0.001$). Group 2 also showed significant improvements at Day 14 ($B = 0.790$, $SE = 0.162$, $t = 4.878$, $p < 0.001$) and Day 28 ($B = 1.097$, $SE = 0.303$, $t = 3.616$, $p < 0.001$). For Group 3, only Day 28 produced a significant change ($B = 0.893$, $SE = 0.242$, $t =$

3.687, p < 0.001), while Day 14 was marginally non-significant (B = 0.355, SE = 0.211, t = 1.686, p = 0.093). All these results are in comparison to Group 4 (control).

These results indicate that all active intervention groups experienced significant improvements in sleep, particularly at Day 28, compared to the reference group. The random effects of individual and school-level variations were accounted for, underscoring the relevance of the mixed-effects model in explaining individual differences.

Term	B	SE	t	df	p
(Intercept)	3.008	0.110	386	27.314	0.000
Day 14	-0.016	0.137	310	-0.118	0.906
Day 28	-0.368	0.176	310	-2.097	0.037
Group 1 (bbs only)	0.043	0.123	386	0.352	0.725
Group 2 (education + bbs)	-0.206	0.130	386	-1.587	0.113
Group 3 (education only)	-0.051	0.179	386	-0.284	0.776
Day 14:Group 1 (bbs only)	0.717	0.154	310	4.656	0.000
Day 28:Group 1 (bbs only)	1.195	0.190	310	6.299	0.000
Day 14:Group 2 (education + bbs)	0.790	0.162	310	4.878	0.000
Day 28:Group 2 (education + bbs)	1.097	0.303	310	3.616	0.000
Day 14:Group 3 (education only)	0.355	0.211	310	1.686	0.093
Day 28:Group 3 (education only)	0.893	0.242	310	3.687	0.000