Research Article

Uninterrupted conventional didactic large group teaching versus intermittent lightening-up schemes used to modify the aftermath of a class for andragogy

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ABSTRACT

Introduction: Compulsory attendance in medical education needs constant attention which becomes challenging at times. The objective was to compare outcome of a class conducted with continuous didactic lecture compared to intermittent rest or music as lightening-up schemes in between the class.

Methodology: After Ethical clearance and informed consent, 3 Physiology classes between 2pm-3pm were chosen for challenging topics. For the first 2 classes, 62 1st year physiotherapy students were randomised into 2 groups equally i.e. music and rest. In the 1st lecture, 30 min was didactic lecture then, 5min reinforcement of rest to one group and short self-chosen music through ear-phones to the second group was given. Then class was continued. 2nd lecture was similar as 1st except the groups were reversed. The 3rd lecture acted as a control i.e. without reinforcements. Assessment was 10 MCQs as pre and post-test. Difference between pre and post-test was calculated to assess improvement.

Results: Analysis was done to assess on students own-best and on inter-group assessment. The post-test and the difference scores were statistically better with reinforcement when assessed for students own best. But when it came to analysing the performance in-between the groups, the results were not statistically significant. There were a greater number of students who showed improvement in performance with a reinforcement method, while analysing whole group performance, results looked indifferent.

Conclusion: Five minutes reinforcement sessions of rest or music between the lecture might help to break the monotony but listening to music might deviate their concentration more than required and needs further analysis.

Keywords: Reinforcements; large group teaching, Didactic lecture, Music, Andragogy.

1. INTRODUCTION

The pursuit of effective methods for conveying curriculum in ways that inspire students to learn and apply concepts is an ongoing and unrestricted endeavour [1]. Didactic lectures for large groups remain a prevalent teaching methodology, ideal for delivering core knowledge to substantial audiences in a structured and efficient manner. This approach is particularly beneficial when there is a significant knowledge disparity between instructors and learners [2]. Attending didactic lectures provides several advantages, such as fostering professional networks, camaraderie, a sense of belonging, and other aspects of social behaviour. These are vital tools for developing young healthcare professionals and provide a platform for instructors to identify and mentor students who may struggle with either academic content or social engagement [3,4].

However, didactic lectures have certain limitations, such as their inherently passive nature, potential for monotony, limited capacity to monitor large groups, and the unidirectional flow of information [5]. Medical education is a lifelong journey [6], requiring graduates from various fields, including physiotherapy, to undergo rigorous training across multiple disciplines, procedural skills, treatment

methodologies, and other essentials necessary for excellence in healthcare. As such, traditional didactic lectures can be enhanced by integrating innovative, research-based methodologies and shifting toward a learner-centered approach [4,7].

Despite this, regulatory bodies mandate attendance in large group lectures across medical disciplines, which remains crucial not only for delivering curriculum content within a limited time frame but also for influencing academic performance and exam eligibility. Research indicates that enforcing mandatory attendance policies can improve overall exam results [8, 9]. However, sustaining student attention during lectures, especially on challenging topics delivered post-lunch, can be difficult. Various reinforcement techniques, such as problem-based learning, seminars, small group discussions, simulations, case-based teaching, assessments, videos, and quizzes, have been implemented in many institutions [8,9,10]. These student-centered techniques require substantial preparation, including lesson planning, group formation, resource gathering, and adjustments to the teaching schedule, demanding considerable effort from the instructor.

Students in medical and physiotherapy programs often experience significant stress levels during their training. While some stress is necessary for achieving academic excellence, excessive stress can lead to issues such as coping difficulties, anxiety, or even depression, which are common among graduate students. Positive coping mechanisms, or mind-body practices, can help restore psychological balance and resilience. Examples include meditation, relaxation techniques like yoga and pranayama, listening to music, and active involvement in team-building activities [11-13]. Music, in particular, has been effectively used in the field of medicine as a reinforcement approach. Although the therapeutic interactions between music and health are well-documented [14-16], there remains an opportunity to explore music's role in medical education further.

With this context, our hypothesis posits that music and rest breaks interspersed within lectures can enhance students' attention spans more effectively than traditional continuous lectures. This study was therefore conducted to compare the performance of physiotherapy students after a conventional continuous lecture and after incorporating music or rest intervals as reinforcement strategies.

2. OBJECTIVE

To assess the performance of students after traditional continuous didactic lecture as large group teaching method and compare it with reinforcements in between the lecture using either self-chosen music or rest.

3. MATERIALS AND METHODS

3.1 Study Design: Crossover randomized controlled trial

3.2 Study Subjects: First-year physiotherapy students

3.3 Inclusion Criteria: All 62 first-year physiotherapy students were included in the study.

3.4 Procedure: Informed consent was obtained from all participants, and institutional ethical clearance was secured. The study focused on three afternoon classes (2:00 pm to 3:00 pm), selected for their challenging physiology topics. Post-lunch sessions were chosen due to known issues with decreased student concentration.

The 62 first-year physiotherapy students were randomized into two groups (music and rest) using the odd-even method. In preparation for the sessions, students in the music group were asked to bring earphones and have a self-selected music playlist ready. Students in the rest group were instructed to relax quietly with their eyes closed during the reinforcement period.

In the first lecture on the topic "Autonomic Nervous System," a 30-minute didactic lecture was followed by a 5-minute reinforcement period: the odd group received a rest interval (quiet time) while the even group listened to their selected music through earphones. After the reinforcement, the lecture resumed for an additional 30 minutes.

The second lecture on "Limbic System" followed the same structure, except that the groups were reversed— the odd group listened to music, and the even group rested. The third lecture on

"Cerebral Cortex and Speech" was conducted as a continuous 60-minute didactic lecture without any reinforcement, serving as the control session. To minimize potential instructor bias, the same faculty member conducted all three lectures. For each lecture, a set of 10 multiple-choice questions (MCQs), each worth one mark, was administered as both a pre-test and a post-test. Improvement and effectiveness were assessed by calculating the difference between pre-test and post-test scores for each method (music, rest, and control). A higher difference score indicated better retention, comprehension, and performance, helping to mitigate potential confounding factors associated with varying lecture topics.

Each student participated in all three lecture formats, serving as their own control. For analysis, three groups were created based on the reinforcement type:

1. **Music Group**: Reinforcement with self-chosen music
2. **Rest Group**: Reinforcement with quiet rest
3. **Control Group**: No reinforcement

In each case, pre-test, post-test, and difference scores were recorded to assess improvement levels across the three groups.

4. RESULTS

SPSS version 22 software was used for the data analysis. ANOVA, Paired t test and Pearson's correlation were applied.

A histogram was generated to show the average pre-test scores of all 62 students across the three lectures combined. The majority of students had an average pre-test score of 3 out of 10. The pre-test score is calculated as the average of all three pre-tests conducted, yielding a total of 186 data points (62 students x 3 lectures). The paired t-test, used to compare pre-test and post-test scores, indicated a statistically significant improvement in all three groups (music, rest, and control), confirming that each reinforcement method had a measurable impact on students' performance.
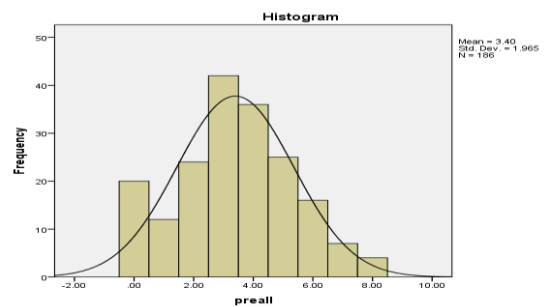

Figure 1: Average pre-test scores of all students for all three lectures

All 62 students participated in each of the three groups, allowing the data to be analyzed in three distinct ways:

- **Intra-Individual Analysis**: Since each student experienced all three protocols (continuous lecture, music, and rest), individual performance was assessed to determine each student's best post-test score.
- **Topic-Wise Performance Analysis**: Performance across the three topics was analyzed by calculating the mean and standard deviation (SD) to evaluate scores with interventions (music/rest) and without intervention (continuous lecture).
- **Inter-Group Analysis**: Using ANOVA, the mean scores of the three groups were compared to analyze performance differences between the music, rest, and control conditions.

The rationale for conducting multiple assessments was to determine if performance varied based on the intervention used, the topic chosen, and whether these effects could be generalized.

4.1 Intra-Individual Analysis: Each student's performance across all three scenarios was evaluated to identify their best post-test score. Since both music and rest interventions were incorporated as intermittent strategies within the lecture, performance was examined with and without reinforcement.

- Among the 62 students, 32 (51.61%) achieved their best post-test scores with reinforcement (music or rest), while 19 students (30.65%) achieved their best scores without intervention. Additionally, 11 students (17.74%) showed similar

improvement with and without reinforcement.

- As previously noted, a higher difference score between pre-test and post-test indicates enhanced retention, understanding, and performance. In this regard, 42 students (67.74%) exhibited a better difference score with reinforcement (Table-1).

These results suggest that 32 students performed optimally with an intervention, & 42 students demonstrated greater improvement in difference scores when reinforcement (music or rest) was used.

Table- 1: Percentage of students who scored their own best post-test in music, rest and control groups

Total students 62	Best with Music	Best with Rest	Best with Intervention (Total music/rest)	Best with Control	No Change	P value *
Post Test	12 -19.35%	15 (24.19%)	32 -51.61%	19 (30.65%)	11 (17.74%)	<0.05
Diff Score	14 -22.58%	22 (35.48%)	42 -67.74%	16 (25.81%)	4 -6.45%	<0.05

*P value was analysed between intervention and no-intervention group.

4.2 Topic-Wise Performance Analysis:

In the first lecture on the **Autonomic Nervous System**, the rest group achieved a higher mean post-test score (6.3) and difference score (3.47) compared to the music group. For the second lecture on the **Limbic System**, the music group outperformed the rest group, with a mean post-test score of 6.93 & a difference score of 2.79. In the third lecture on **Cerebral Cortex and Speech** (the control, with no intermittent intervention), the mean post-test score was 6.45, & the difference score was 2.48, which were comparable to scores from the intervention sessions.

Although the mean scores across the three lectures indicated some variation, the differences were not statistically significant. Additionally, Pearson's correlation analysis did not reveal significant associations (Table-2).

Table – 2: Average scores of 3 lectures conducted separately. Scores indicate average of 10 MCQs.

Mean scores	ANS		LS		CC and Speech	P Value
	Music	Rest	Music	Rest	Control	
Post test	5.59	**6.3**	**6.93**	6.5	6.45	> 0.05
Difference	2.39	**3.47**	**2.79**	2.07	2.48	> 0.05

* ANS- Autonomic Nervous System, LS- Limbic System, CC- Cerebral Cortex

* P value not significant:

4.3 Inter-group analysis:

In the inter-group analysis, which compared the music, rest, and control groups as a whole, irrespective of specific topics, it was observed that the rest group had the highest post-test mean score (6.19 ± 2.05) and also the greatest difference score (2.68 ± 2.3).

Table- 3: Pre-test and average of post-test scores of music, rest and control groups for total 10 MCQs

	Music post[1]	Music diff[2]	Restpost[3]	Restdiff[4]	Controlpost[5]	Controldiff[6]	Pre-test all[7]
N in each group	62						186
Mean ± SD	5.48±2.73	2.40±1.89	**6.19±2.05**	**2.68±2.30**	5.82±2.47	2.24±2.00	3.40±1.97
Skewness	-0.671	0.185	-0.981	-0.144	-1.022	0.126	0.066
Standard Error of Skewness	0.304	0.304	0.304	0.304	0.304	0.304	0.178
Minimum	0	-1	0	-3	0	-2	0
Maximum	10	7	9	8	10	7	8

[1] Musicpost- post test score in music group; [2] Musicdiff- difference score in music group
[3] Restpost- post test score in rest group; [4] Restdiff- difference score in rest group
[5] Controlpost- post test score in control group; [6] Controldiff- difference score in control group;
[7]Pre-test all- pre-test of all the groups

This suggests that participants in the rest group showed the most improvement after the intervention. Meanwhile, the control group (with no intervention) had a slightly higher post-test mean compared to the music group, which had the lowest post-test score. These results indicate that, within this setup, resting was more effective than music or no intervention for improving post-test performance.
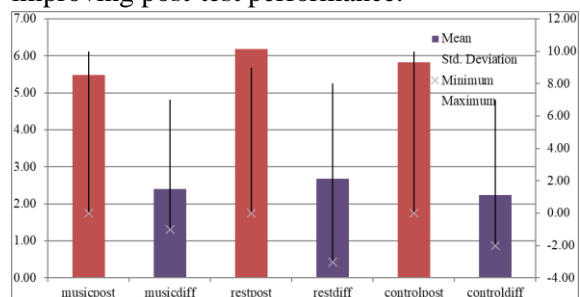

Figure- 2:   Average marks obtained for 10 MCQs in music, rest and control groups

- **Musicpost**: Post-test score in the music group.

- **Musicdiff**: Difference score in the music group.

- **Restpost**: Post-test score in the rest group.
- **Restdiff**: Difference score in the rest group.
- **Controlpost**: Post-test score in the control group.
- **Controldiff**: Difference score in the control group.

The rest group had both the best post-test average (**Restpost**) and the highest average difference score (**Restdiff**), indicating that participants in this group showed the most improvement. This further supports the idea that resting may be more beneficial than music or no intervention for improving post-test outcomes in this context

5. DISCUSSION

Medical education demands continuous learning and updating of knowledge throughout one's career, making undivided attention during training essential to establish a foundation for future learning. However, some topics or lectures can challenge students' ability to maintain consistent focus. Additionally, the impact of didactic lectures often depends on the students' attention spans and responsiveness [17]. In today's digital era, where information is readily accessible, sustaining attention has become more challenging. Consequently, the ability to retain and apply learned material has declined. Despite its limitations, large-group lectures remain an effective and widely used format for sharing vital information from experienced educators, making it essential to find ways to sustain attention in this setting.

Recognizing this, the present study was conducted with the hypothesis that using reinforcement techniques during lectures—specifically, short music or rest sessions—could improve students' attention spans compared to uninterrupted traditional lectures, especially for challenging topics. The results showed that students performed better post-test and had higher difference scores when reinforcement methods, such as a 5-minute rest or music break, were incorporated. When comparing groups, the rest group performed best, followed by the control group, with the music group showing the lowest performance, though differences were not statistically significant. The study suggested that

individual improvement, rather than group averages, may offer more meaningful insights, as a notable number of students benefited from in-class interventions.

Listening to music is known to be a gratifying experience with stress-relieving effects [18], as it engages the brain areas associated with emotional processing, especially within the dopaminergic reward system. Dopamine release in the ventral striatum contributes to music's rewarding effects [19]. While prior studies suggest that listening to certain types of music, such as Mozart or soothing genres, can improve spatial cognition and reasoning [20], our study's findings diverged, potentially due to students choosing their own music. Given that each musical genre, tempo, and pitch affects cognition uniquely, and preferences vary across and within individuals[21,22], the self-selected music in this study may have introduced variability in outcomes. Some music choices may have been calming, while others may have distracted students.

Mindfulness, much like meditation, involves quietly focusing attention, which can help alleviate anxiety and improve mood. Without interventions to manage stress, anxiety can persist, disrupting concentration and depleting the energy needed to focus on the material. Our findings align with studies indicating that relaxation techniques reduce anxiety, refocus attention from external distractions to the current task, enhance concentration, and improve working memory and academic performance [23-25].

6. CONCLUSION

Reinforcement techniques, like brief intervals of music or rest, could be valuable additions to traditional teaching methodologies, helping to interrupt the monotony of didactic lectures. A five-minute rest period within a one-hour lecture has shown promise in boosting students' attention and, consequently, their performance levels. Similarly, a five-minute music break could enhance students' mood and increase their attentiveness in class. However, given that this was the students' first experience with these methods, the results may be inconsistent and less

reliable, suggesting the need for further research to confirm these findings

7. LIMITATIONS

- Future studies should involve a larger and more diverse sample of students from various educational backgrounds to enhance generalizability.
- In this study, students selected music of their preference rather than a standardized genre, resulting in diverse genres with potentially varying physiological effects.
- Reinforcement methods, such as music and rest breaks, should be applied across multiple lectures to determine if their effects are consistent or if variations occur over time.
- The assessment approach could be expanded to include measures of memory retention and comprehension depth to gain a more comprehensive understanding of the reinforcement methods' impact on learning outcomes.

CONFLICTS OF INTEREST: The authors declare that there are no conflict of interest.

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