



# Using White Noise to Increase On-Task Behavior



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## Objective

Recent empirical research shows that background noise (white noise) increases productivity and improves performances for children who struggle with attention and concentration. This study determined to -

- 1) Evaluate the effects of using white noise in sound-canceling headphones for students with ADHD
- 2) Limit off-task behavior and increase independent academic responsiveness and task completion

## Participants

Six total: 2<sup>nd</sup> level students (two boys/1girl); 5<sup>th</sup> level students (three boys)

Inclusion criteria:

- Diagnosis of ADHD;
- May or may not take medication for ADHD;
- Displayed high frequency of disruptive, off-task behaviors
- Infrequently finished daily in-class assignments.

Off-task behaviors:

- Verbal: talking about something unrelated to assignment;
- Motor: not attending to tasks because of movement for extended periods of time;
- Passive: looking at something other than the assignment

## Design

ABAB Reversal Design

- Phase 1: Baseline
- Phase 2: Intervention
- Phase 3: Return to Baseline/Withdraw Intervention
- Phase 4: Intervention

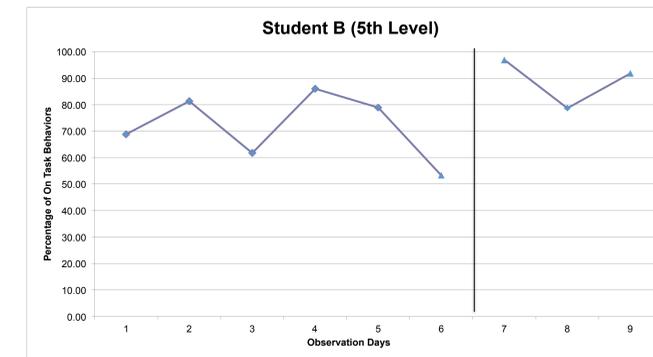
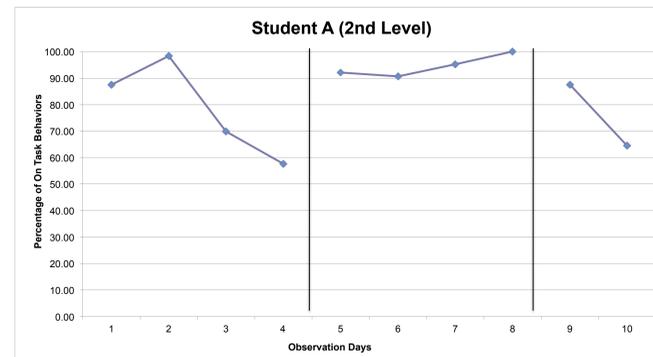
## Method

Prior to data collection, participants wore the headphones without activated NC and without WN to minimize the novelty of the headphones.

Data Collection: 15s momentary time sampling for approximately 15 minutes

- Setting: Language Arts classrooms during routine independent work time
- 2<sup>nd</sup> level – same time of day every session (mid-morning)
- 5<sup>th</sup> level – due to a rotating schedule, sessions occurred either mid-morning or early afternoon

Visual analysis revealed that Students A and B stayed on-task more frequently while listening to white noise.



## Headphones

### Backbeat Pro by Plantronics

Features:

- Sound-Canceling
- Bluetooth (three headphones to one iPad)
- Motion-Sensored
- Timer Setting
- Soft/lightweight



## White Noise

### SleepStream for the iPad/iPhone

White Noise Setting:

- “Noise” → “SleepStream Noise” (similar to dry drones)
- + “Binaural Beats” → “Learning” → “10m to restless” (a tone that begins with a “stress frequency” and lowers until it reaches a “relaxation frequency.” It remains at the low tone until the noise is manually stopped)

Volume:

Apple Volume is universal. By pairing headphones with the iPad, volume settings change simultaneously. Volume adjustment on the headphones automatically changes the iPad volume, and vice versa. This feature controlled volume across all three headphones so each participant received the same dB level.

On the iPad,

- 0 bars = silence
- 1 bar = 30 dB
- 2 bars = 40 dB
- 3 bars = 50 dB \*LEVEL USED IN STUDY
- 4 bars = 60 dB \*level of concentration/relaxation
- 5 bars = 70 dB \*level of annoyance

## How It Works:

Individuals with ADHD experience three core neuropsychological deficiencies in executive functioning:

- (1) Inattention
- (2) Hyperactivity
- (3) Impulsivity

These deficiencies inhibit individuals from processing information quickly or accurately and cause disruptions in task completion (not just academically).

Most of these deficiencies originate due to decreased activity in the prefrontal cortex.

## How Does White Noise Affect the Brain?

When an individual hears two separate frequencies, one in each ear, the brain reconciles the difference by creating a **binaural beat**.

In doing so, neurons begin rapidly firing down new pathways, causing **hemispheric synchronization**.

This increased activity begins the moment the brain receives auditory input, especially through earbuds or headphones.

## It works like an equation:

$$\begin{aligned} \text{Auditory Input} + \text{Binaural Beats} \\ = \text{Increased neural activity} \\ = \text{PRODUCTIVITY!} \end{aligned}$$

## Data Analysis and Results

At the present time, this study is not yet complete. However, initial visual data analysis reveals a positive effect (as observed by abrupt changes).

When activated in sound-canceling headphones, white noise increased participants’ on-task behaviors.

After day one of intervention, one student commented, “Look how much I got done today!”

Inter-rater agreement and procedural fidelity were used throughout the study.

Stable or descending data patterns during baseline condition were observed before introducing the intervention condition.

Likewise, stable or ascending data patterns during the intervention phases were observed before withdrawal of intervention and return to baseline.

## Potential Benefits

For students:

- increased engagement during independent activities, increased productivity and task completion, increased attention, higher accuracy, and decreased negative reinforcement by the teacher.

According to research, white noise also –

- Reduces anxiety
- Increases dopamine
- Increases creativity
- Elevates energy
- Causes better sleep

## References

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