

COLUMBIA UNIVERSITY APPLIED ANALYTICS

Does the type of pillow impact your sleep quality?

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Presentation Outline

POINTS OF DISCUSSION

- Statement of Problem
- Research Questions
- Importance of Study
- Research Plan
- Statistical Analysis Plan
- Simulated Study
- Limitations & Uncertainties





Statement of Problem

According to Centers for Disease and Control, **1/3** of American adults don't get enough sleep, and choosing the appropriate pillow can help optimize sleep posture and promote high-quality sleep (Bernateck et al. 2008).

Since sleep is an important factor for human beings, we have decided to experiment how different types of pillows have an impact on the quality of sleep.

Importance of Study

- Quality sleep allows our bodies and minds to recharge and help prevent certain medical conditions, such as type 2 diabetes, heart diseases, and poor mental health (Pacheco, D. & Singh, A., 2022).
- We will conduct this study in partnership with Mattress Firm who is interested in marketing its latex pillows and knowing which age group to target.
- This study will also allow the company to have a scientifically-backed advertising campaign, if latex pillows improve sleep quality and if certain age group have lower sleep quality.



Two types of Pillow we are experimenting

FEATHER (CONTROL)



According to a study by Gordon and Grimmer-Somers, results showed consistent **poor sleeping comfort** and quality for those using **feather pillows**, and consistently **high sleeping comfort** and quality for those using **latex pillows**.

LATEX (TREATMENT)



FITBIT

TOOL TO TRACK OUR DEPENDANT VARIABLE - SLEEP SCORE

A study called “Accuracy of Wristband Fitbit Models in Assessing Sleep: Systematic Review and Meta Analysis” showed that Polysomnography (PSG) was the best metric for the assessment of sleep parameters and all Fitbit models showed accurate PSG.



Research Question #1

Is the mean sleep score measured by the Fitbit Charge 5 higher for the latex pillow than for the standard feather pillow?

NULL HYPOTHESIS

The mean sleep score for the latex pillow is not significantly higher than that for the standard feather pillow.

ALTERNATIVE HYPOTHESIS

The mean sleep score for the latex pillow is significantly higher than for the standard feather pillow.

Research Question #2

Is the mean sleep score as measured by the Fitbit Charge 5 for the age group (21-40) lower than for the age group (41-60)?

NULL HYPOTHESIS

The mean sleep score for the age group (21-40) is not significantly lower than that for the age group (41-60).

ALTERNATIVE HYPOTHESIS

The mean sleep score for the age group (21-40) is significantly lower than that for the age group B (41-60).

Brief Schedule

THERE ARE THREE PHASES.



STAGE 1

Preperation
(2 weeks)

Recruit participants, gather equipments, and set up Fitbits.

STAGE 2

Exercise Experiment
(2 weeks)

The participants will carry out the experiment by going to sleep with the Fitbit and their assigned pillows.

STAGE 3

Analyze Data
(3 weeks to 1 month)

Analyze the data and produce an in-depth report on the impact of different pillows.

Research Plan

POPULATION OF INTEREST

We will recruit 400 people between the ages of 21-60

SAMPLE SELECTION

Recruit participants from Dynata and conduct the random sampling

DATA SECURITY

Store data on Amazon Web Service (AWS) cloud

OUTCOME (DEPENDENT)

Sleep score measured from Fitbits

TREATMENTS (INDEPENDENT)

- 1) Type of pillow: latex vs feather
- 2) Age Group: 21-40 vs 41-60

OTHER VARIABLES

Gender
(Binary: Male & Female)

Statistical Analysis Plan

RESEARCH QUESTION 1

Test = two sample t-test

Mean (Control) = 60

Mean (Treatment) = 65

SD (Control) = 10

SD (Treatment) = 10

Our p value is < 0.05, which shows that participants who used latex pillow had a higher mean sleep score than participants who used feather pillow

RESEARCH QUESTION 2

Test = two sample t-test

Mean (21-40) = 52

Mean (41-60) = 60

SD (21-40) = 10

SD (41-60) = 10

Our p value is < 0.05, which shows that participants in age group 21-40 had a lower mean sleep score than participants in age group 41-60

Simulated Studies



Research Question	Scenario	Mean Effect in Simulated Data	95% Confidence Interval of Mean Effect	% of FP	% of TP	% of FN	% of TN
Question 1	No Effect	0.2496	(1.399, Inf)	0.05	0.078	0.922	0.95
Question 2	Effect	5.05	(3.400, Inf)	0.05	1	0	0.95
Question 3	No Effect	-0.1496	(-Inf, 1.499)	0.05	0.061	0.939	0.95
Question 4	Effect	-8.05	(-Inf, -6.4)	0.05	1	0	0.95

Limitations & Uncertainties

- **We are only considering gender as a binary variable**
- **The participants can pass on their fitbit to others**
- **Participants might use their everyday pillow instead of the pillow assigned to them**
- **Blinding might not be possible because participants may know which pillow they are assigned to.**
- **There may be participation bias**



Thank You