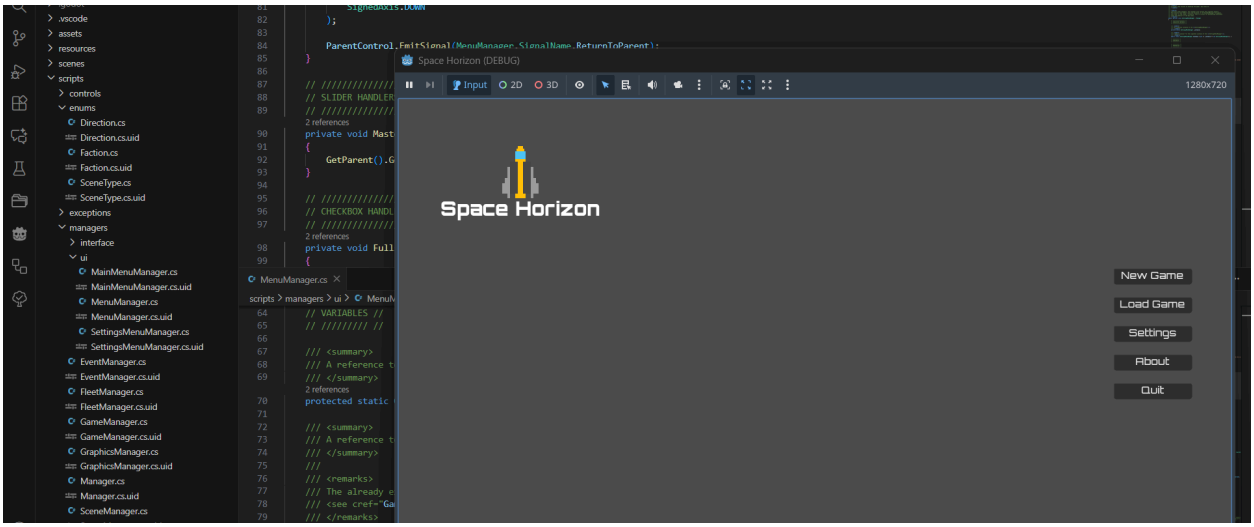

Predicting Daily Productivity in Game Development Through Personal Habits and Caffeine Regulation

Student Information

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A. Project Overview

Brief Description (3–5 sentences):

This project tracks personal game development productivity alongside caffeine consumption, sleep quality, and work habits over 10 weeks while developing Space Horizon, a 2D sci-fi game. Daily data collection includes development hours, feature completion, caffeine intake (coffee 0-2 cups, tea 0-4 cups), sleep

duration, mood/energy/focus/motivation ratings, screen time, and work session timing. The goal is to identify which combination of sleep quality, caffeine timing, and work session structure maximizes code commits and feature completion rates for a night owl developer with high caffeine tolerance.

Prompt Questions:

- The main goal is to identify which combination of sleep quality, caffeine timing, and work session structure maximizes daily code commits and feature completion rates during game development.
- As a solo developer with high caffeine tolerance from years of intensive work and a consistent pattern of late-night productivity, I want to understand whether my current work habits are actually optimal or just habitual. Optimizing my productivity patterns could significantly impact Space Horizon's development timeline and output quality.
- I hope to discover my personal optimal caffeine consumption pattern (amount and when during the day), whether late-night work sessions are genuinely more productive for me, and if regulated caffeine intake still meaningfully affects productivity despite high tolerance. Ultimately, I want actionable data-driven insights to work smarter, not just harder.

B. Research Objectives

Primary Objective

To identify which combination of sleep quality, caffeine consumption patterns, and work session structure maximizes daily code commits and feature completion rates during Space Horizon development.

Secondary Objectives

- To determine whether regulated caffeine intake still correlates with productivity given the subject's pre-existing high caffeine tolerance from years of intensive work.

- To analyze whether late-night work sessions produce higher productivity metrics compared to daytime sessions, and whether this advantage is attributable to chronotype or reduced environmental interruptions.
- To explore patterns in mood, energy, focus, and motivation ratings to identify early warning signs of burnout or diminishing productivity trends over the ten-week period.

C. Data to Be Collected

Use the table below or convert into a Notion database.

Data Variable	Type (Quant/Qual)	Unit/Scale	Frequency of Collection	Tool/App
Development Hours	Quantitative	hours	daily	Screen Recording + Manual Log
Coffee Intake	Quantitative	Mugs (0-2)	daily	Manual Log (Excel)
Tea Intake	Quantitative	Mugs (0-4)	daily	Manual Log (Excel)
Git Commits	Quantitative	count	daily	Git Log
Tasks Completed	Quantitative	count	daily	GitHub Projects
Sleep Duration	Quantitative	hours	daily	Manual Log (Excel)
Mood Rating	Quantitative	Likert 1-5	daily	Manual Log (Excel)
Energy Level	Quantitative	Likert 1-5	daily	Manual Log (Excel)
Focus Quality	Quantitative	Likert 1-5	daily	Manual Log (Excel)
Motivation Level	Quantitative	Likert 1-5	daily	Manual Log (Excel)

Data Variable	Type (Quant/Qual)	Unit/Scale	Frequency of Collection	Tool/App
Total Screen Time	Quantitative	hours	daily	Phone Tracking / Manual
Programming Screen Time	Quantitative	hours	daily	Screen Recording Timestamps
Work Session Count	Quantitative	count	daily	Screen Recording Sessions
Work Session Timing	Qualitative	Morning / Afternoon / Evening / Night / Midnight / Mixed	daily	Screen Recording Timestamps
Primary Focus Area	Qualitative	Ship Systems / UI / Controls / Docs / etc.	daily	GitHub Projects + Manual Log
Other Deadlines Present	Qualitative	Yes / No	daily	Manual Log (Excel)
Day of Week	Qualitative	Mon - Sun	daily	Auto-fill (Excel)
Date	Qualitative	MM/DD/YYYY	daily	Auto-fill (Excel)

Guiding Questions:

- Code frequency, sleeping pattern (main sleep only), caffeine (coffee & tea) intakes, and coding session time.
- Data is collected daily.
- Mostly excel, but OBS studio will be used for recording (doubling as a dev log). GitHub will also be used for other various tracking methods.
- Consistency is maintained through automated tracking via GitHub and screen recordings. And in case there's a cross-midnight session, the session will count to the day it began.

D. Proposed Methodology

Describe **how** you will conduct the study.

4.1 Data Collection Plan

- Data will be recorded in an Excel spreadsheet for manual entries, with automated data captured through GitHub and OBS Studio screen recordings.
- Consistency is maintained through automated tracking via GitHub and screen recordings, standardized daily logging time, fixed measurement scales, and clear operational definitions for each variable. Cross-midnight sessions are assigned to the day they began.
- 10 weeks / 70 days

4.2 Analytical Methods

Check those you will use:

- [x] ~~Descriptive statistics~~
- [x] ~~Data cleaning & preprocessing~~
- [x] ~~Exploratory visualization~~
- [x] ~~Correlation analysis~~
- [x] ~~Regression modeling~~
- [ ] Hypothesis testing (t-test, ANOVA, etc.)
- [x] ~~Clustering or time-series analysis (optional)~~

4.3 Tools

Check all that apply:

- [x] ~~Python~~
- [x] ~~Pandas~~
- [x] ~~Matplotlib / Seaborn~~
- [ ] SQL
- [x] ~~Excel / Google Sheets~~

- [x] ~~Jupyter Notebook / Google Colab~~
- [ ] Notion habit tracker

E. Related Work (Short Review)

1. **The SPACE Framework for Developer Productivity**

This framework proposes measuring developer productivity across five dimensions: Satisfaction, Performance, Activity, Communication, and Efficiency, arguing that no single metric can capture the full complexity of developer productivity.

It supports the current project by providing the theoretical foundation for combining quantitative metrics (commits, hours) with qualitative measures (mood, satisfaction) in a multi-dimensional productivity assessment.

This project expands on that work by applying the multi-dimensional approach to individual solo game development and investigating caffeine consumption as a lifestyle factor affecting productivity—an element not addressed in the SPACE framework.

DOI: https://queue.acm.org/detail.cfm?id=3454124

2. **Habitual Caffeine Intake, Genetics and Cognitive Performance (2025)**

This study investigated caffeine × gene interactions on cognitive performance, finding significant effects in social cognition and executive function domains, with 'slow' metabolizers showing higher social cognition performance among high-caffeine consumers.

It relates to this project by providing contemporary evidence that genetic factors and habitual consumption patterns interact to influence cognitive outcomes, directly informing the investigation of whether caffeine still affects productivity in someone with high tolerance.

This project builds on those findings by investigating caffeine's correlation with real-world programming productivity in an authentic 10-week long development

context rather than controlled laboratory cognitive tests, filling the ecological validity gap.

DOI: https://pubmed.ncbi.nlm.nih.gov/39648354/

3. **Night Owls Show Better Cognitive Performance – UK Biobank Study (2024)**

Using UK Biobank data from over 26,000 participants, researchers found that evening chronotypes ("night owls") performed better on cognitive tests than morning types, with evening types scoring 7.5-13.5% higher, while optimal sleep duration of 7-9 hours was associated with better cognitive performance.

It supports the current project by validating the hypothesis that night owl work patterns (7PM-7AM) may be genuinely productive rather than merely habitual, providing empirical evidence that chronotype impacts cognitive function.

This project adds to the literature by focusing specifically on programming productivity in game development and tracking how work session timing interacts with caffeine consumption and sleep quality in a solo developer over an extended period.

DOI: https://doi.org/10.1136/bmjph-2024-001000

F. Hypothesis / Expected Outcome

I predict that despite the high caffeine tolerance from years of intensive work, regulated caffeine intake will show no significant correlation with productivity metrics, demonstrating that caffeine's effectiveness diminishes with habitual use. Furthermore, I expect late-night work sessions (7PM-7AM) to consistently outperform daytime sessions due to the absence of household interruptions that fragment my focus during conventional work hours, challenging productivity advice that prioritizes morning work without accounting for individual environmental constraints and chronotype.

G. Ethical Considerations

The collected data include development productivity metrics such as Git commits, tasks completed, and work hours, which are similar to public dev logs, alongside habit data like caffeine intake, sleep duration, and mood/energy/focus/motivation ratings.

Personal habit data will remain private and only be reported in aggregate form in the final paper, with all data stored locally on password-protected devices and screen recordings deleted after data extraction (unless uploaded by the subject as his dev log for content purposes).

The data present minimal risks as they consist of non-sensitive personal habits and programming metrics only.

H. Project Timeline

Fill in your expected timeline.

Week	Task
0	Set up data collection spreadsheet, configure OBS Studio for screen recording, begin daily logging
1-10	Continuous daily data collection (development metrics, caffeine intake, sleep, mood ratings, screen recordings)
11	Data cleaning and preprocessing (handle missing values, verify timestamps, extract features from screen recordings); Begin Exploratory Data Analysis (EDA)
12	Complete EDA and correlation analysis; Feature engineering and regression modeling
13	Advanced analysis (time-series trends, clustering), model evaluation, create visualizations
14	Write research paper draft (introduction, methodology, results, discussion)
15	Revise paper, format IEEE style, finalize references and final visualizations
16	Final review, proofreading, and submission

Feasibility Check

Ask yourself:

- Can I realistically collect this data daily/weekly?
- Do I have access to the apps/devices needed?
- Are the variables measurable?
- Can I finish this within the term?

Self-assessment:

- [ ] Very feasible
- [x] ~~Feasible~~
- [ ] Needs simplification
- [ ] Not feasible (must revise proposal)

Instructor Approval Section

(To be filled out by instructor)

- **Approved:** ✓ / ❌
- **Revision Needed:**
- **Comments:**