

Article

# Full title of the paper (Capitalized)

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**Abstract:** [Usually, 150-200 words overview of the research paper you have conducted – includes short introduction to the research question, review to methods, review of key results, conclusion for the results in line with the research paper.]

**Keywords:** ADHD; behavioral activity; machine learning; time series

## 1. Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a complex neurodevelopmental disorder that shares symptoms with many other conditions, and it is often misdiagnosed. It is estimated that 8.4% of children and 2.5% of adults have ADHD, and presentation and assessment are different in the two groups (Elmaghraby and Stephanie Garayalde [1]). There are three main types of ADHD: inattentive presentation, hyperactive/impulsive presentation, and combined presentation (Elmaghraby and Stephanie Garayalde [1]). The inattentive type is characterized by difficulty staying on task, sustaining focus, and staying organized (noa [2]). Hyperactivity is excessive movement and may present as restlessness or talking too much in adults (noa [2]). Impulsivity is when a person acts without thinking and may manifest as desire for immediate rewards or the inability to delay gratification (noa [2]). The combined type is when both symptoms of the inattentive type and the hyperactive/impulsive type are present (noa [2]). ADHD can impact individuals in many areas of their life such as academic/professional, interpersonal relationships, and daily functioning (Elmaghraby and Stephanie Garayalde [1]). In adults it can have far reaching detrimental effects and lead to poor self-worth, sensitivity towards criticism, and increased self-criticism (Elmaghraby and Stephanie Garayalde [1]). However, sometimes ADHD is not identified until a person is an adult if the symptoms were not recognized, they had mild ADHD, or they managed sufficiently well until demands of college/work (noa [3]). Due to the harmful consequences ADHD can lead to, it is important that it is diagnosed and treated.

There are many challenges to diagnosing ADHD, particularly in adults. Adult ADHD symptoms are sometimes harder to discern than ADHD symptoms in children (noa [4]). Combining this with the fact that adult ADHD symptoms are similar to those in other conditions can make diagnosis difficult (noa [4]). Stress, illness, and other mental conditions such as anxiety or mood disorders can all have symptoms that are similar to ADHD (noa [4], noa [3]). For example, emotional dysregulation present in ADHD can be diagnosed with a mood disorder or ADHD symptoms can be covered up by substance abuse (Katzman *et al.* [5]). Physicians are also usually more familiar with mood and anxiety disorders, leading to misdiagnosis and delays in ADHD treatment (Katzman *et al.* [5]). Additionally, other mental health conditions such as anxiety, mood, and substance use disorders are common in adults with ADHD (noa [3]). Studies have shown that 18.6% to 53.3% of people with ADHD have depression and almost 50% of people with ADHD have an anxiety disorder (Katzman *et al.* [5]). Some researchers suggest that in some cases stress, depression, and anxiety may be manifesting due to undiagnosed

or untreated ADHD (Katzman *et al.* [5]). These factors make ADHD difficult to recognize and treat, leading to an under-diagnosis and under-treatment of adult ADHD (Katzman *et al.* [5]). Due to the extensive effects ADHD can have, it is important that it is properly diagnosed and treated.

There is no specific procedure to diagnose ADHD and psychiatrists, neurologists, primary care doctors, clinical psychologists, or clinical social workers can all diagnose adults with ADHD (Contributors [6]). Steps to getting a diagnosis may include a physician using behavioral questionnaires to ask about the impacts ADHD has, possible symptoms present in childhood, talking to a parent or partner, and psychological tests (Contributors [6]). They may also test for learning disabilities, other mental health conditions, or physical illnesses to rule these options out (Contributors [6]).

## 2. Methods

### 2.1. Dataset

[Contrast this to what would have been your ideal dataset. How did you arrive at choosing this dataset. Provide details on the dataset, size, gender split and count, age, how it was collected, ethical concerns, etc. Also provide details on data collection and access. Usually 100-200 words.]

### 2.2. Data Cleaning

In the Hyperaktiv data set the time series data for each subject is stored in a separate CSV file. To analyze the data, I combined all of the activity CSVs into one file, keeping track of which subject each data point came from. *TODO: add more detail if needed* There were 108 subjects, yet only some had activity data. I only used subjects with activity data, which reduced the data set to 83.

*TODO: comment on if I make all activity csvs same length, cleaning time series (seasonality, get rid of noise, etc.)*

*TODO: Add about heart rate if you get there*

### 2.3. Variables of Interest

[Describe the variables that you are using in your datasets. Describe the rationale for using these variables. Varies in length.]

### 2.4. Other Important Features

[Also comment on other things which are relevant to your research paper. Varies in length.]

##Data Analyses

[What analyses are you doing why. Varies in length.]

## 3. Results

[Summary of results analyses 1]

[Add visualizations from analyses. Varies in length.]

[Summary of results analyses 2]

[Add visualizations from analyses. Varies in length.]

## 4. Discussion

[Explain what your results mean in the context of the literature cited in the introduction. Minimum of 750 words.]

*potential issue - diagnosis is still coming from people*

## 5. Future Directions

[How could someone continue the work? Around 150-200 words.]

## 6. Personal Reflection

[What was your original research question? Why did you have to deviate? What ideal dataset would be recommend collecting? How was this process of developing a research paper? 250 words]

## 7. Code availability

All analysis code for this article is available at: <https://github.com/i-m-foster/sds300np-ireneFoster>

## 8. Acknowledgements

[Mention who you would like to thank. Any grants or people. Varies in length.]

Bulleted lists look like this:

- First bullet
- Second bullet
- Third bullet

Numbered lists can be added as follows:

1. First item
2. Second item
3. Third item

The text continues here.

All figures and tables should be cited in the main text as Figure 1, Table 1, etc.



**Figure 1.** This is a figure, Schemes follow the same formatting. If there are multiple panels, they should be listed as: (a) Description of what is contained in the first panel. (b) Description of what is contained in the second panel. Figures should be placed in the main text near to the first time they are cited. A caption on a single line should be centered.

**Table 1.** This is a table caption. Tables should be placed in the main text near to the first time they are cited.

Title 1	Title 2	Title 3
entry 1	data	data
entry 2	data	data

**Conflicts of Interest:** The authors declare no conflict of interest.

## References

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