An Investigation into the use of Fitts's Law as a Discriminant for the Identification of Dyslexia in Primary School Children

Sam Dixon
40056761

Submitted in partial fulfilment of the requirements of
Edinburgh Napier University for the Degree of
MEng (Hons) Software Engineering

School of Computing

2017

Authorship Declaration

I, Sam Dixon, confirm that this dissertation and the work presented in it are my own achievement.

Where I have consulted the published work of others this is always clearly attributed;

Where I have quoted from the work of others the source is always given. With the exception of such quotations this dissertation is entirely my own work;

I have acknowledged all main sources of help;

If my research follows on from previous work or is part of a larger collaborative research project I have made clear exactly what was done by others and what I have contributed myself;

I have read and understand the penalties associated with Academic Misconduct.

I also confirm that I have obtained informed consent from all people I have involved in the work in this dissertation following the School's ethical guidelines.

Signed:

Date:

Matriculation no:

Data Protection Declaration

Under the 1998 Data Protection Act, The University cannot disclose your grade to an unauthorised person. However, other students benefit from studying dissertations that have their grades attached.

Please sign your name below one of the options below to state your preference.

The University may make this dissertation, with indicative grade, available to others.

The University may make this dissertation available to others, but the grade may not be disclosed.

The University may not make this dissertation available to others.

Abstract

This dissertation records and describes the process and evaluation undertaken while attempting to discern whether a Fitts's Law based application is a suitable test criteria for the identification of possible Dyslexia.

- Summary intro and context
- Summary of Literature Review
- Summary of Methodology
- Summary Results and Evaluation
- Summary of Conclusion

Contents

List of Tables

List of Figures

1 Acknowledgements

I would like to thank my dog, family and the pub.

2 Introduction

2.1 Background and Context

2.1.1 Dyslexia

`Brief description of Dyslexia and the methods used for it identification`
Dyslexia is present in around 10% of the British population to some degree; about 4% of the population have severe Dyslexia [1] [4]. While the understanding and acceptance of Dyslexia has improved greatly in recent years, the assessment of whether a person has Dyslexia has remained relatively stagnant. Dyslexia is one of the few learning difficulties which does not have an assessment funded by the NHS. The current and most accurate form of assessment remains in the form of traditional "pen-and-paper" tests. [2] [3]

2.1.2 Dot-to-Dot Test

`Describe the Dot-to-Dot test. Bring attention to Jon's observation of dyslexic children having different outcomes`
The Dot-to-Dot Test is a system developed by Professor Jon Kerridge [ref]. The goal of the application is to measure a child's ability to draw lines between a series of point as they appear on the screen. Kerridge hypothesises that a child with dyslexia will have measurably different results from a child that does not have dyslexia.

2.1.3 Fitts's Law

`Description of Fitts's Law. Although mainly used by designers for ergonomics, the Dot-to-Dot test can easily be analysed with Fitts's.`
Fitts's Law is a form of analysis used to predict the "difficulty of movement" when using a digital input. Paul Fitts developed the theory in 1954, and it has since been utilised globally to aid in the design of ergonomic and easy-to-use computer interfaces.
As the Dot-to-Dot Test comprises of drawing lines between points - Fitts's analysis can be applied to the results.

2.1.4 Aims and Goals

`Outline the aims and goals of this project - deliverables`
The goal of this project is to determine whether or not Fitts's Analysis is valid method of dyslexia detection.
There are a number of precursors to determining whether Fitts's is a suitable discriminant, including;

- Collecting Dot-to-Dot data from Dyslexic and Non-Dyslexic participants for use as a control group
- Fitts Analysis of Dyslexic and Non-Dyslexic data for significant differences
- Evaluation of Fitts's analysis via a third, experimental group

3 Literature Review

3.1 Introduction

`Explain that there is very little existing literature for Dyslexia Diagnoses using Fitts's - but that it has been used to previously to identify other learning and congestive difficulties`

While Fitts's Law has existed for around 60 years, it's use as an identification tool in that time has been very limited. There exists only a small number of papers where Fitts's Analysis has been used as an attempt to identify children with Cognitive Development and Motor Skill difficulties.

3.2 Disability Detection with Fitts's Law

`Discuss and evaluate papers where Fitts's analysis is used for detection`

3.3 Dyslexia Detection

`Discuss and evaluate papers with novel Dyslexia detection methods`

3.4 Summery

`Describe and discuss any common themes or oddities found`

4 Methodology

`Describe how processes were carried out`

- Analysis of existing data
- Collection of new data (describe range of participants)
- Analysis of new data
- Identifying trends/patterns

5 Results and Evaluation

What was discovered - is it valid / accurate

6 Conclusion

Summarise findings

7 Reflection

What went well, what didn't - what would change if you did it again

References

[1] British Dyslexia Association. Frequently Asked Questions — British Dyslexia Association.

[2] British Dyslexia Association. About the British Dyslexia Association — British Dyslexia Association, 2016.

[3] NHS Choices. Dyslexia - Diagnosis - NHS Choices.

[4] NHS Choices. Dyslexia - NHS Choices.

Appendices