ISTD Submission

One Size Does Not Fit All

Luke O'Reilly
2024

Concept

student assessment scheme **2024**

1 The Line

The line occupies a central role in graphic communication in general, and typography in particular. The baseline, the timeline, the underline... from the basic building blocks of our alphabet which emanate from the individual strokes of the written word to make the rhythmic pattern of stems in a typeface, to the hot-metal typesetting innovation of the lin-o-type, and the Bézier curve which has facilitated the description of identity in the scalable, mutable forms of variable typefaces. We open up the lines of communication, toe the line, push something over the line, or have a line of work. The line describes, invites, directs and frames.

Artist and educator Paul Klee famously said drawing was 'taking a line for a walk', anthropologist Tim Ingold describes the itinerant journey of a line as always in the process of becoming. The word 'line' comes from the Latin word 'linum' meaning linen, a reference to the use of cords or threads to mark measurements, and also suggests the woven nature of a text – interlacing lines of text and vertical stems form the 'textura' of the first typefaces. Lines in cartography define perimeters or pathways, much like the path direction of a contour in bezier drawing.

The brief
You are invited to investigate and typographically interpret or subvert your subject matter with rigour and creativity. You might tell the story of a single line, or of linearity more generally. You might take a tangent, or typographically express converging lines of thought. Follow a thread of research and take us with you on this journey.

Strategy and Research
You need to define a context, identify a target audience and build a strategy that rationally underpins the development of appropriate outcomes. We expect rigorous sketchbook research with evidence of your responses to the information that you uncover. We also expect to see a range of initial potential directions explored in order to be able to understand what has informed the focus of your subsequent concept and design development.

Your sketchbook content should reflect the development of your strategic and interpretive thinking. It should be vibrant and organic – full of visual references; notations; sketches; exploration of materials and ideas. It should not be a scrapbook or dissertation and it should not be retrospective – 'Now I've finished the piece – time to fill the sketchbook with photocopies'.

Target Audience/Deliverables
The content, format, media and range of your project outcomes should be determined by their suitability and potential to influence your chosen target audience – as expressed in your strategy.

Submission Guidance/Requirements
Your submission should include sufficient appropriate material to show that you have addressed the brief comprehensively and clearly expressed your design and typographic skills.
It must include:
- Strategy
- Research
- Design development
- Specifications/Grid(s)
- Final outcomes

Your **Strategy and Specifications should be submitted in a single document** that will be assessed not only for its design but will incorporate the required minimum 500 words that should reflect your ability to handle text matter and information hierarchy. This is partly to reduce the need for screen-based pieces to meet that textual word count in the prototype but also to establish parity of typographic ability across media.

Cross-reference this project brief with the **Assessment Criteria** and **Tutor and Student Guide.**

Sea tides Luke O'Reilly	Education Luke O'Reilly	Crossing the line with comedy Luke O'Reilly	Road connections Luke O'Reilly
Linear society Luke O'Reilly	Line between good and evil Luke O'Reilly	Drawing a line in the sand, settling arguments Luke O'Reilly	Transportation network Luke O'Reilly
Pipe lines Luke O'Reilly	Celtic patterns Luke O'Reilly	Networks Luke O'Reilly	Roots of trees Luke O'Reilly

Montessori
Primary
Secondary
College
Masters
Job
Retire

Luke O'Reilly

Education system

Breaking the Norm

Alternative Methods of education

Luke O'Reilly

Waldorf education in Canada Luke O'Reilly	Build emotional intelligence, empathy and self-esteem Physical vitality, stamina and perseverance Physical vitality, stamina and perseverance Responsibility to nature, work and the society of men, women and children around them. Luke O'Reilly	Time Luke O'Reilly	Longterm process of regular sessions, Luke O'Reilly	Through the seasons Luke O'Reilly	24 sessions Luke O'Reilly
		Space Luke O'Reilly	Woodland or natural environment Luke O'Reilly	Develop the relationship between the learner and the natural world Luke O'Reilly	
Reggio Emilia-inspired schools Luke O'Reilly	project-based: lessons are based on the interest of students. self-guided curriculum solve problems and resolve conflicts. Luke O'Reilly	Risk Luke O'Reilly	Learners are supported to take risks Luke O'Reilly	Putting yourself out of your comfort zone Luke O'Reilly	Risk and challenge is very important for learners development and confidence Luke O'Reilly
		Learner Luke O'Reilly	Taught through the groups interests Luke O'Reilly	Group agreements, both learners and adults decide Luke O'Reilly	
		Growth Luke O'Reilly	Holistic development of all those involved Luke O'Reilly	Creating resilience, confidence, independence and creative learners Luke O'Reilly	

I started by looking at the linear progression of education, work and retirement.

Looking at breaking the norm, through alternative schools and teaching methodologies.

After looking into the alternative forms of education, I thought about how the school system is not suited towards people with learning differences. I focused my research on dyslexia as I have first hand experience of going through the education system with dyslexia.

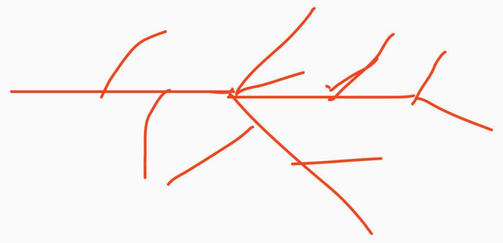
1 out of 10 people globally are dyslexic

"The intuitive mind is a sacred gift, and the rational mind is a faithful servant. We have created a society that honours the servant and has forgotten the gift,"

Albert Einstein

Society + Servant

Society + Intuitive mind



Not Following rules not following pattersn

Luke O'Reilly

Breaking the line of normal thinking

Luke O'Reilly

Traditional school does not give dyslexics a clear path on what the might do in the future

Luke O'Reilly

Most people graduate school and gravitate towards what they were good at

Luke O'Reilly

Vertical thinking

People without Dyslexia

Lateral Thinking

People with Dyslexia

Lateral thinking (horizontal thinking) is a form of ideation where designers approach problems by using reasoning that is disruptive or not immediately obvious.

stoliverplunkett.ie

St.Oliver Plunkets

- Programs that work in teaching reading and spelling to students with Dyslexic difficulties differ in their specific techniques but have many principles in common.
- All programs that work include multi-sensory practice for symbol learning.
- Teaching approaches that are effective use direct, explicit teaching of letter-sound relationships, syllable patterns, and meaningful word parts, and provide a great deal of successful practice of skills that have been taught.
- Fluency-building exercises, vocabulary instruction, language comprehension and writing are also included in comprehensive programs of instruction and intervention.
- Word recognition and spelling skills are applied in meaningful reading and writing of sentences and text passages, and students receive immediate feedback if they make mistakes.
- Guessing at words and skipping words are discouraged and replaced by knowledge of how to analyse and read unknown words.
- Since dyslexia occurs on a continuum, a specialised teaching approach is best, rather than a program or method which does not allow flexibility
- There is comprehensive evidence that supports the use of programs and interventions based on the Orton – Gillingham principles and approaches – a multisensory, structured language approach. This approach taps into sight, sound, movement and touch to help student's link language to words. Students learn the rules and patterns behind why and how letters make the sounds they do.

Our primary goal is to empower our students with dyslexia, nurturing their strengths and helping them overcome any difficulties they may encounter along their educational journey. We adopt a **holistic approach** that focuses on not just academic excellence but also **emotional well-being, social skills development, and self-confidence building.**

In our classrooms, you will find innovative teaching methods and assistive technologies tailored to support dyslexic learners. We provide a **multi-sensory learning** environment that engages students through **visual aids, auditory cues**, and **hands-on activities.** Our dedicated staff ensures that each lesson is structured, explicit, and personalised to optimise learning outcomes.

Beyond academics, we believe in fostering a strong sense of belonging and community. Our school promotes an inclusive culture where students feel accepted, supported, and celebrated for their unique talents. We encourage collaboration, teamwork, and peer-to-peer support, creating an environment where students can grow, learn from one another, and build lifelong friendships.

We actively involve parents and guardians in the education process, recognising the essential role they play in their child's development. We strive to maintain open and transparent communication, providing regular updates, progress reports, and opportunities for parent-teacher collaboration. Together, we can work as a team to ensure the success of every student.

Destigmatizing Working with Dyslexic Learners

Destigmatizing Working with Dyslexic Learners on JSTOR
Riley N. Dandurand, Destigmatizing Working with Dyslexic Learners, The...
jstor.org

This project is focused on helping secondary writing center tutors and faculty to feel they have enough knowledge about dyslexia to help students who choose not to disclose their disability and offer strategies that they may utilize when working with dyslexic students. Furthermore, this project affirms the importance of creating an equitable learning environment for all students who seek the support of a writing center.

Universal design for learning

Universal design for learning (UDL) is a teaching approach that works to accommodate the needs and abilities of all learners and eliminates unnecessary hurdles in the learning process.

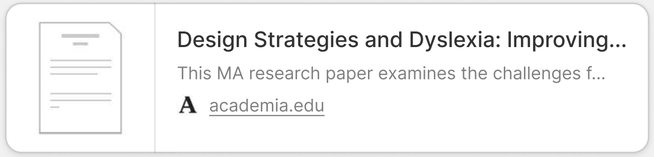
"Those studying dyslexia have found that students are hesitant to disclose their learning disability because of the stigma and feelings of differentiation from their peers" (Brizee et al., 2012).

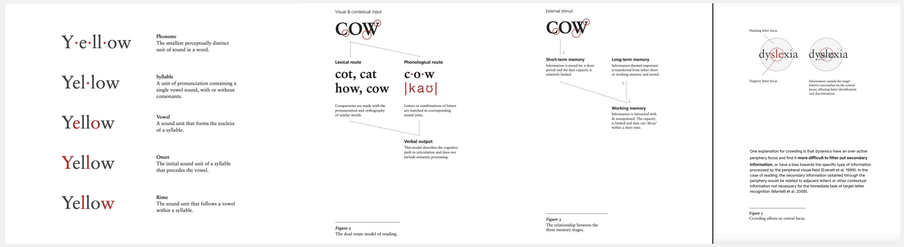
Dyslexia in Incarcerated Men and Women: A New Perspective on Reading Disability in the Prison Population

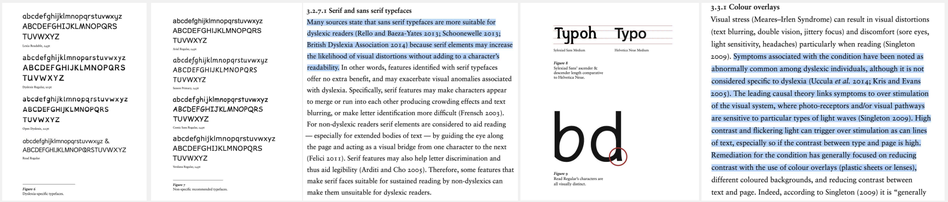
Dyslexia in Incarcerated Men and Women on JSTOR
Laura Cassidy, Kayla Reggio, Bennett A. Shaywitz, John M. Holahan, Sally...
jstor.org

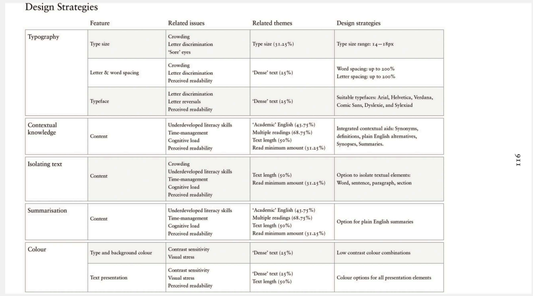
The authors' findings indicate that almost half (47%) of the participants are classified as having dyslexia, 36% proficient, and 17% cognitive impairment.

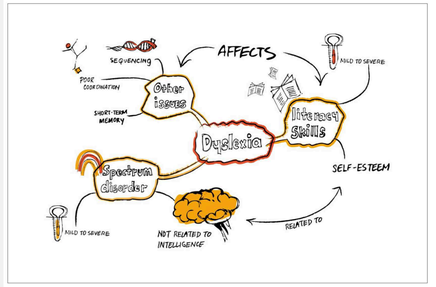
Both dyslexic prisoners and nondyslexic prisoners reported academic and behavioral problems in school that led to decreased years in school and decreased high school graduation rates, with 87% reporting dropping out of school with many inmates dropping out in middle school (mean age of completion of 9.6 years of school), 97% reporting having been in special education or received accommodations, and 59% having failed to receive a high school diploma or equivalency.







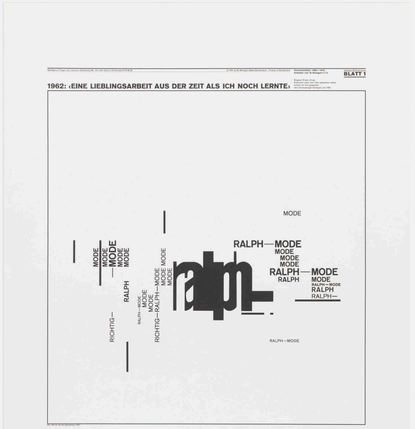


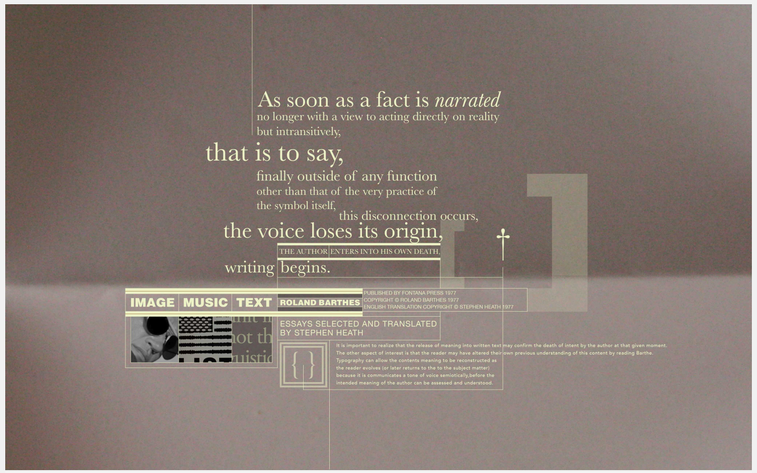


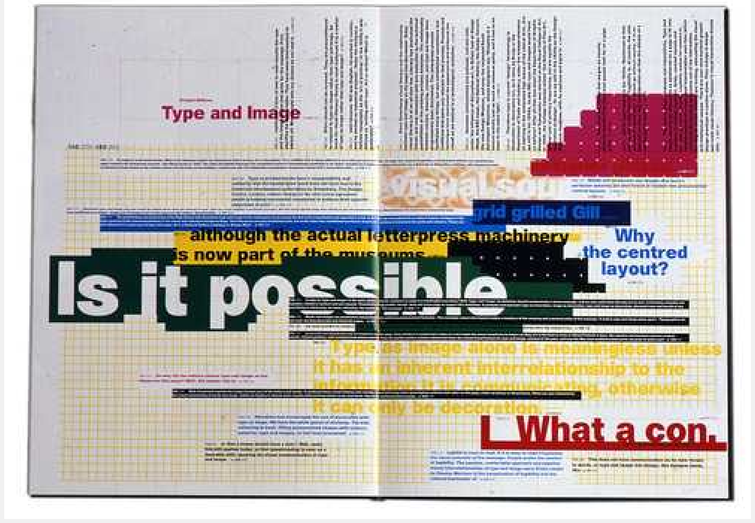
Design strategies and Dyslexia

Lessons In Dyslexic Thinking

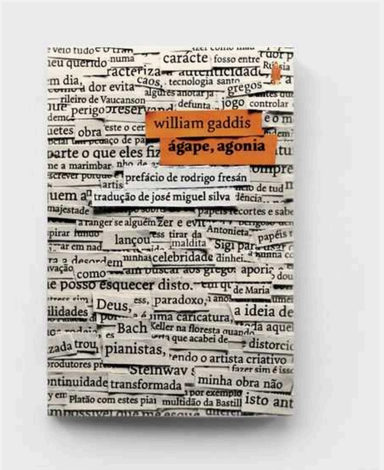
Broadening the understanding of dyslexia

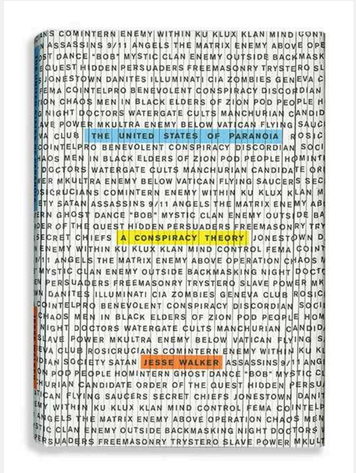


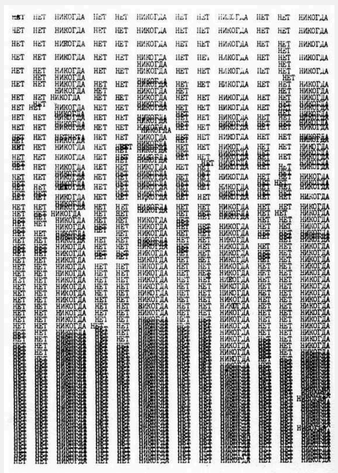


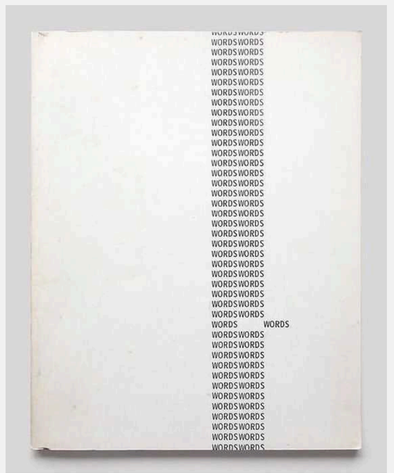


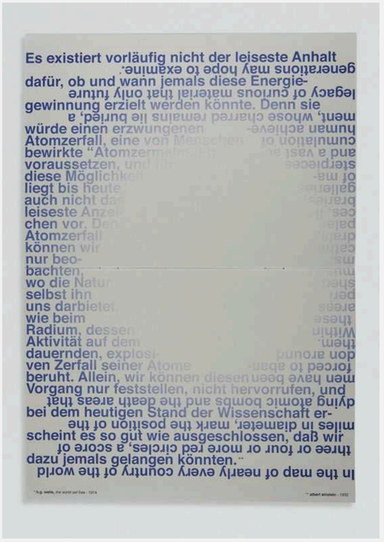
The unconventional way in which dyslexic people see text.

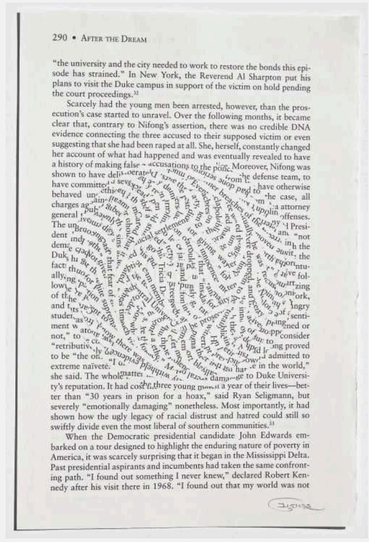

william gaddis
ágape, agonia
prefácio de rodrigo fresán
tradução de josé miguel silva

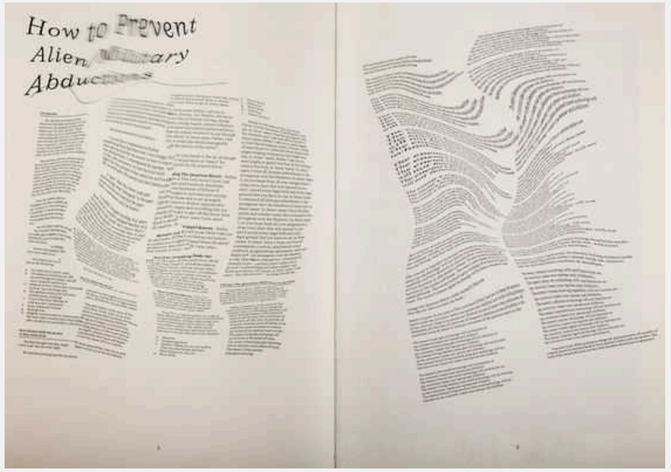

THE UNITED STATES OF PARANOIA
A CONSPIRACY THEORY
JESSE WALKER






Es existiert vorläufig nicht der leiseste Anhalt
dafür, ob und wann jemals diese Energie-
gewinnung erzielt werden könnte. Denn sie
würde einen erzwungenen
Atomzerfall, eine
bewirkte "Atomzer
voraussetzen,
diese Möglich
liegt bis heute
leiseste An
chen vor.
Atomzerfall
können wir
nur beo-
bachten
wo die Natur
selbst ihn
uns darbietet,
wie beim
Radium, dessen
Aktivität auf dem
dauernden, explosi-
ven Zerfall seiner Atome
beruht. Allein, wir können diesen
Vorgang nur feststellen, nicht hervorrufen, und


290 • After the Dream

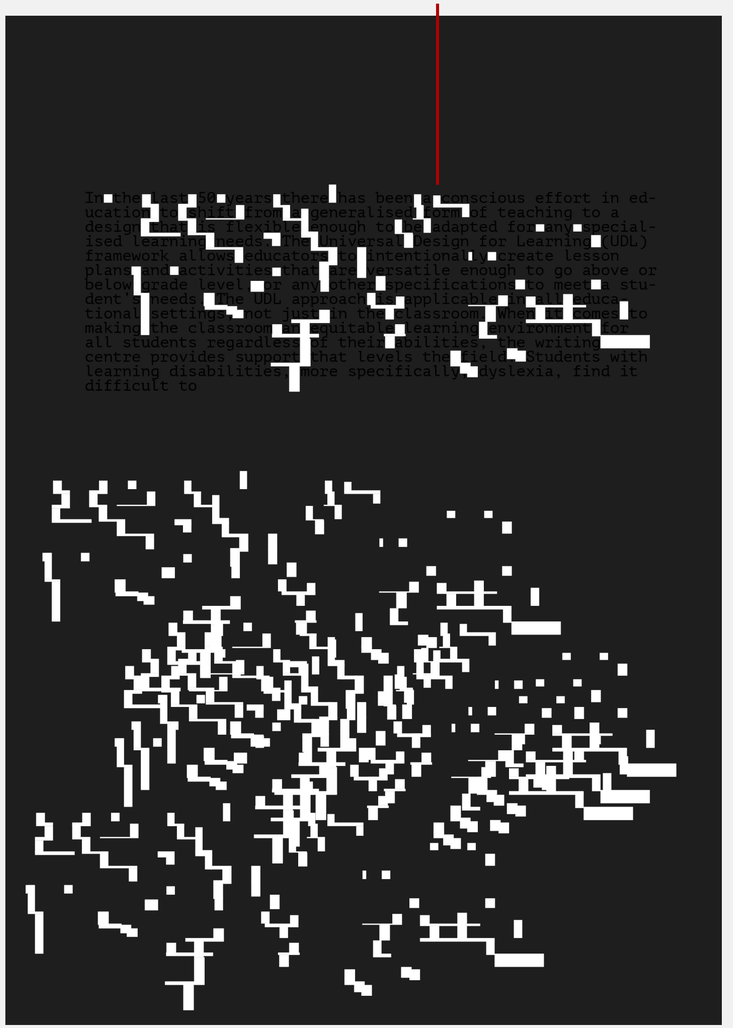

How to Prevent
Alien
Abduc

Design Development

Personally I struggle with the white spaces between letterforms as it causes a strobing effect.

In the last 50 years there has been a conscious effort in education to shift from a generalised form of teaching to a design that is flexible enough to be adapted for any special-ised learning needs. The Universal Design for Learning (UDL) framework allows educators to intentionally create lesson plans and activities that are versatile enough to go above or below grade level, or any other specifications to meet a student’s needs. The UDL approach is applicable in all educational settings, not just in the classroom. When it comes to making the classroom an equitable learning environment for all students regardless of their abilities, the writing centre provides support that levels the field. Students with learning disabilities, more specifically, dyslexia, find it difficult to

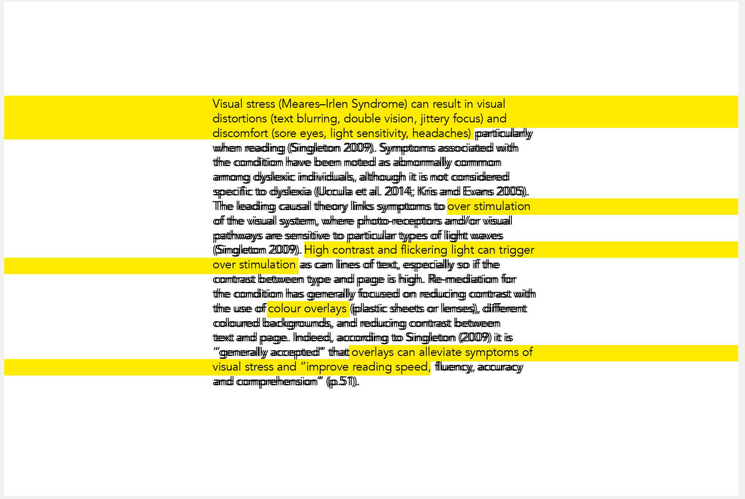
Going in and highlighting all the rivers and gaps between letterforms.



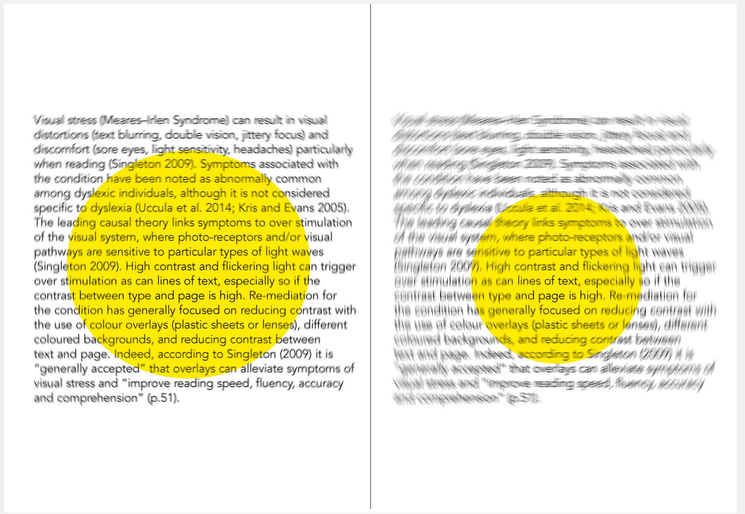
Visually representing the different conditions of dyslexia.

Meares-Irlen syndrome

Meares–Irlen syndrome is a type of visual stress, which interferes with fine vision tasks such as reading. It is thought to be a result of a visual system over-sensitive to certain light stimuli (Singleton 2009). High contrast colours, visual patterns and bright visuals can elicit symptoms. Although considered a distinct condition from dyslexia it may be prevalent in up to thirty four percent of dyslexics (Uccula et al. 2014; Kris and Evans 2005). Symptoms such as text blurring, inaccurate focus and eye-strain can be exasperated by small text and the contrast between text and background colour. Hughes and Wilkins (2000) found a correlation between type size and reading speed in children susceptible to visual stress. The participants of their study — who all reported symptoms associated with Meares-Irlen syndrome were shown to be "disproportionately affected by font size and text characteristics" (Singleton 2009, p.48).

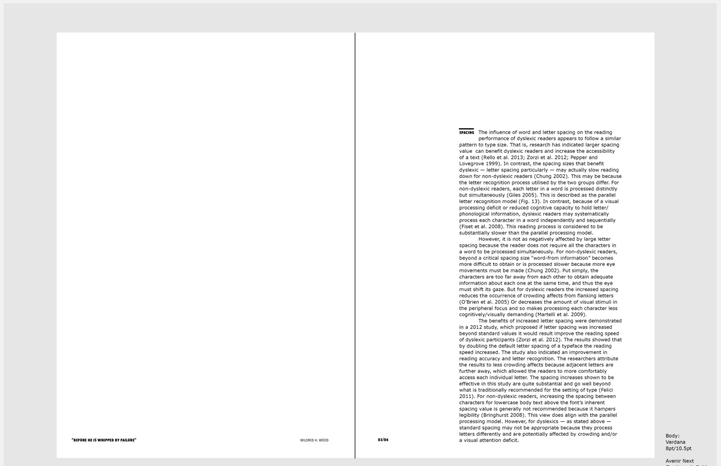


Visual stress (Meares–Irlen Syndrome) can result in visual distortions (text blurring, double vision, jittery focus) and discomfort (sore eyes, light sensitivity, headaches) particularly when reading (Singleton 2009). Symptoms associated with the condition have been noted as abnormally common among dyslexic individuals, although it is not considered specific to dyslexia (Uccula et al. 2014; Kris and Evans 2005). The leading causal theory links symptoms to over stimulation of the visual system, where photo-receptors and/or visual pathways are sensitive to particular types of light waves (Singleton 2009). High contrast and flickering light can trigger over stimulation as can lines of text, especially so if the contrast between type and page is high. Re-mediation for the condition has generally focused on reducing contrast with the use of colour overlays (plastic sheets or lenses), different coloured backgrounds, and reducing contrast between text and page. Indeed, according to Singleton (2009) it is "generally accepted" that overlays can alleviate symptoms of visual stress and "improve reading speed, fluency, accuracy and comprehension" (p.51).



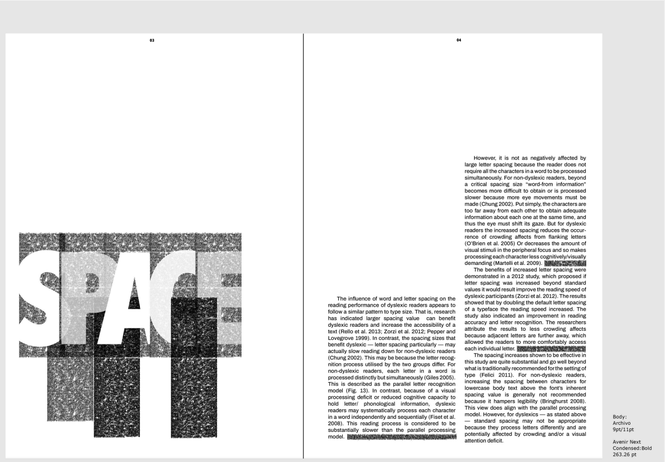
Visual stress (Meares–Irlen Syndrome) can result in visual distortions (text blurring, double vision, jittery focus) and discomfort (sore eyes, light sensitivity, headaches) particularly when reading (Singleton 2009). Symptoms associated with the condition have been noted as abnormally common among dyslexic individuals, although it is not considered specific to dyslexia (Uccula et al. 2014; Kris and Evans 2005). The leading causal theory links symptoms to over stimulation of the visual system, where photo-receptors and/or visual pathways are sensitive to particular types of light waves (Singleton 2009). High contrast and flickering light can trigger over stimulation as can lines of text, especially so if the contrast between type and page is high. Re-mediation for the condition has generally focused on reducing contrast with the use of colour overlays (plastic sheets or lenses), different coloured backgrounds, and reducing contrast between text and page. Indeed, according to Singleton (2009) it is "generally accepted" that overlays can alleviate symptoms of visual stress and "improve reading speed, fluency, accuracy and comprehension" (p.51).

Playing with content and spreads



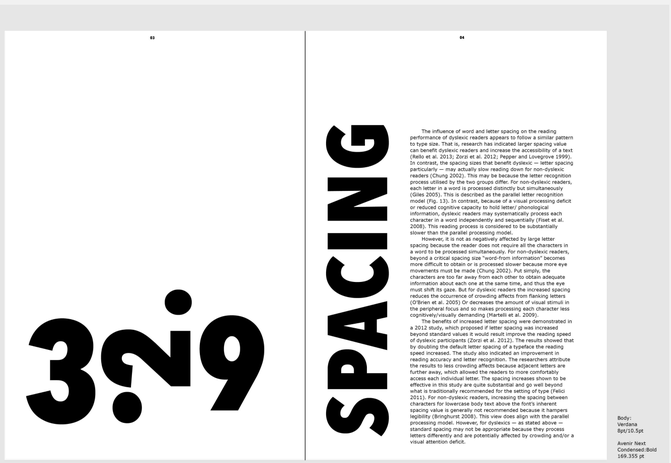
Body:
Verdana
8pt/10.5pt

Avenir Next
Condensed: Bold
8pt/10.5pt



Body:
Archivo
9pt/11pt

Avenir Next
Condensed:Bold
263.26 pt

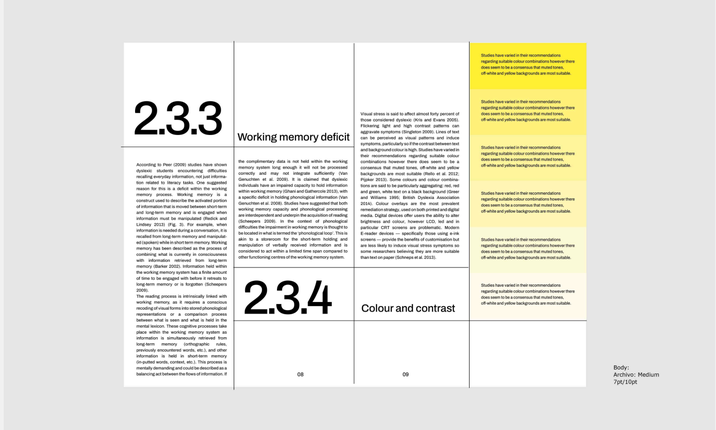


Body:
Verdana
8pt/10.5pt

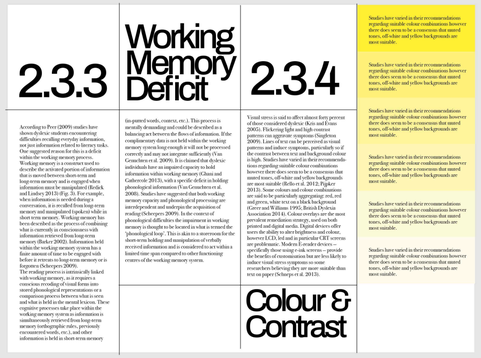
Avenir Next
Condensed:Bold
169.355 pt

Body:
Verdana
8pt/10.5pt

Avenir Next
Condensed:Bold
169.355 pt

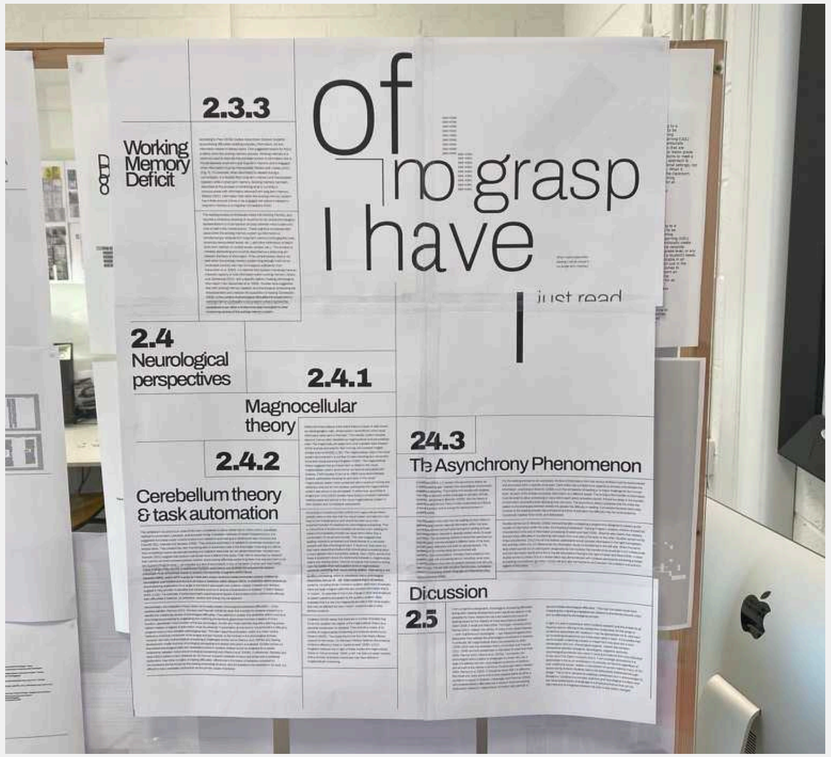


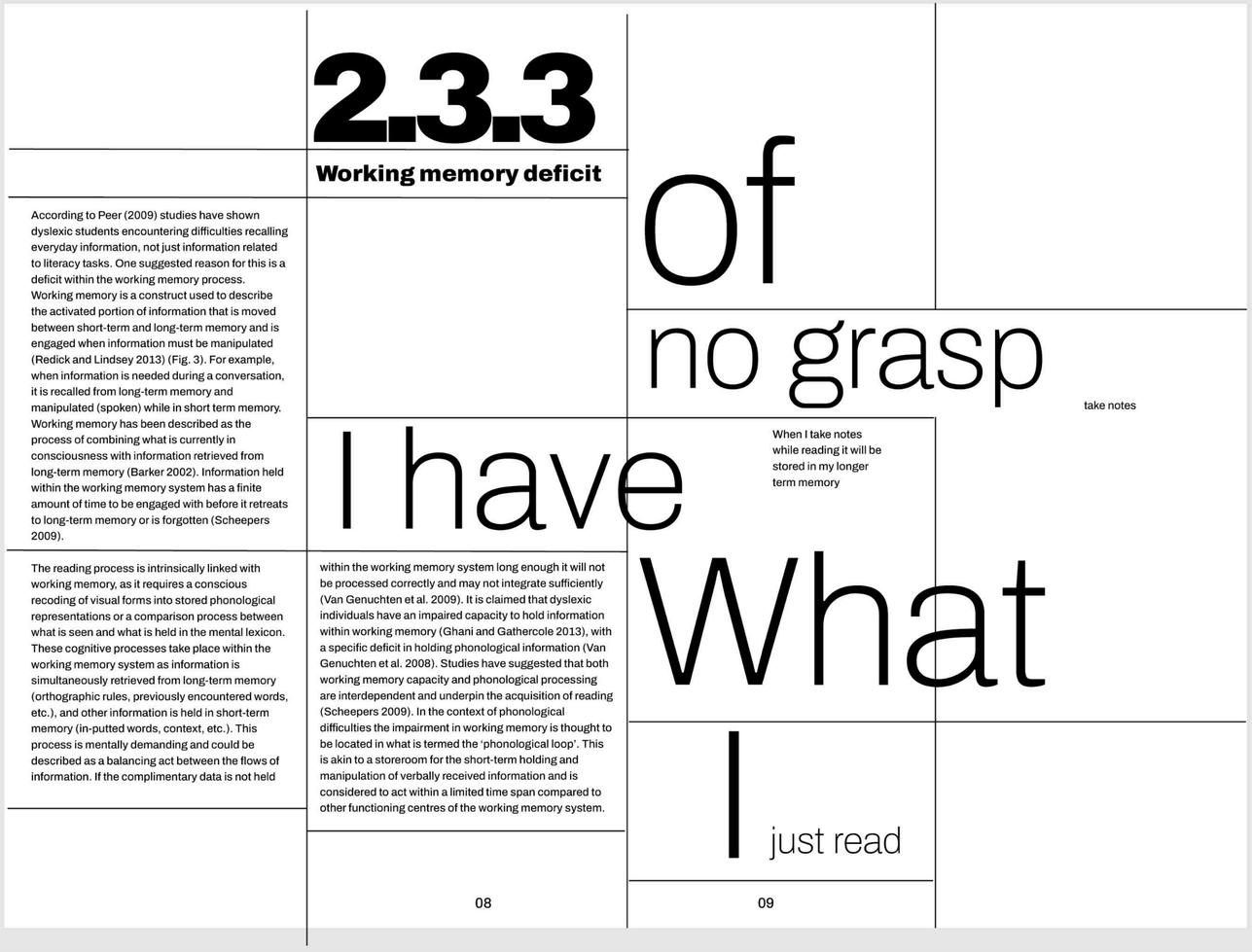
Body:
Archivo: Medium
7pt/10pt



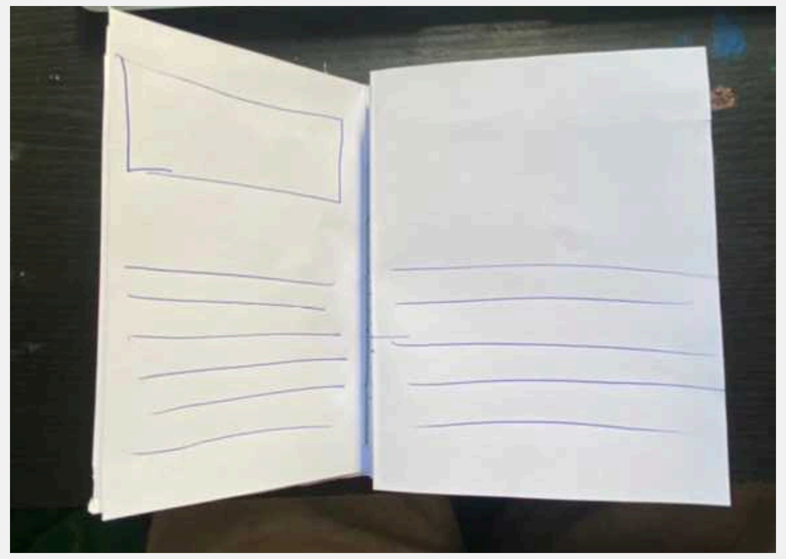
Body:
Bodoni 72: book
9pt/10pt
Heading
Archivo: medium
54pt

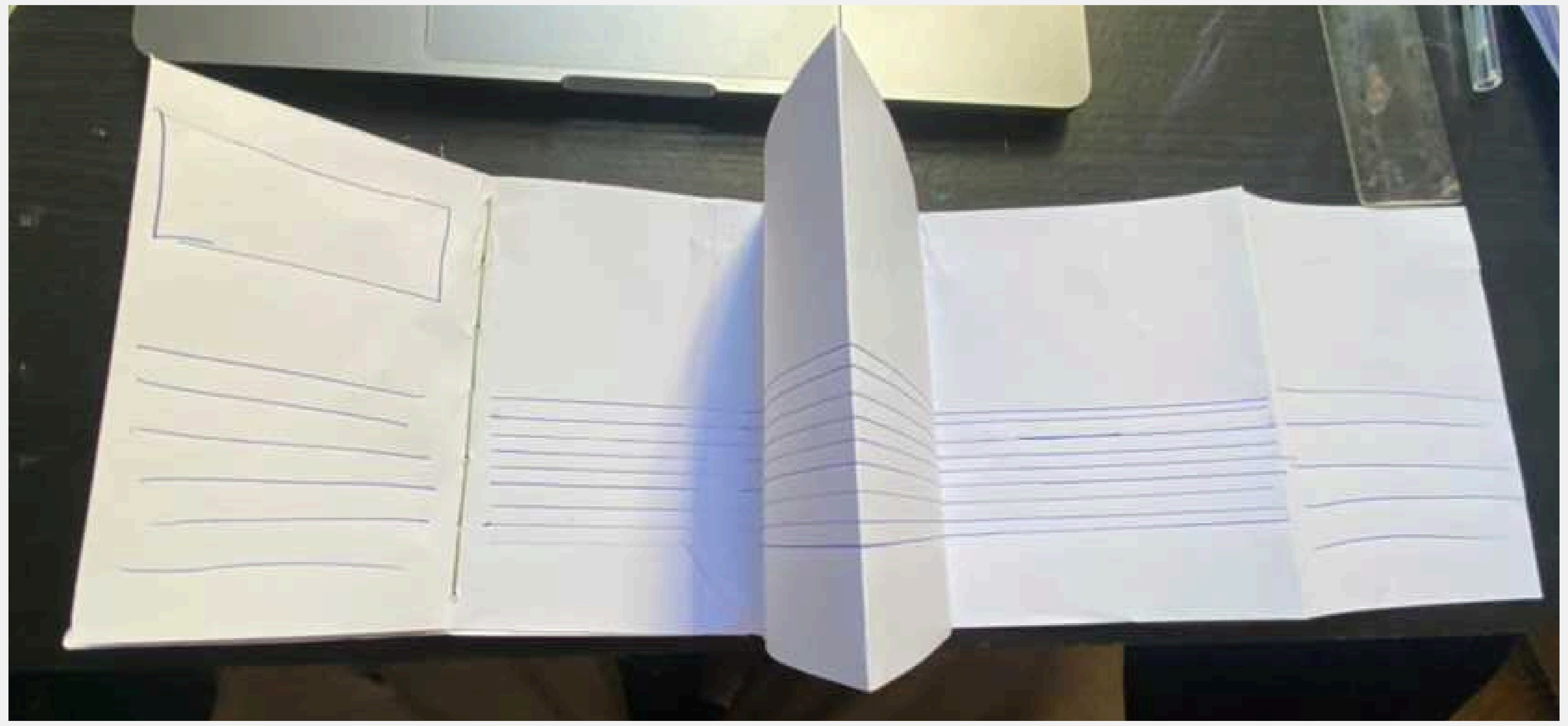
Taking chapters and expressing how it feels as a dyslexic to read long form texts on a large scale.

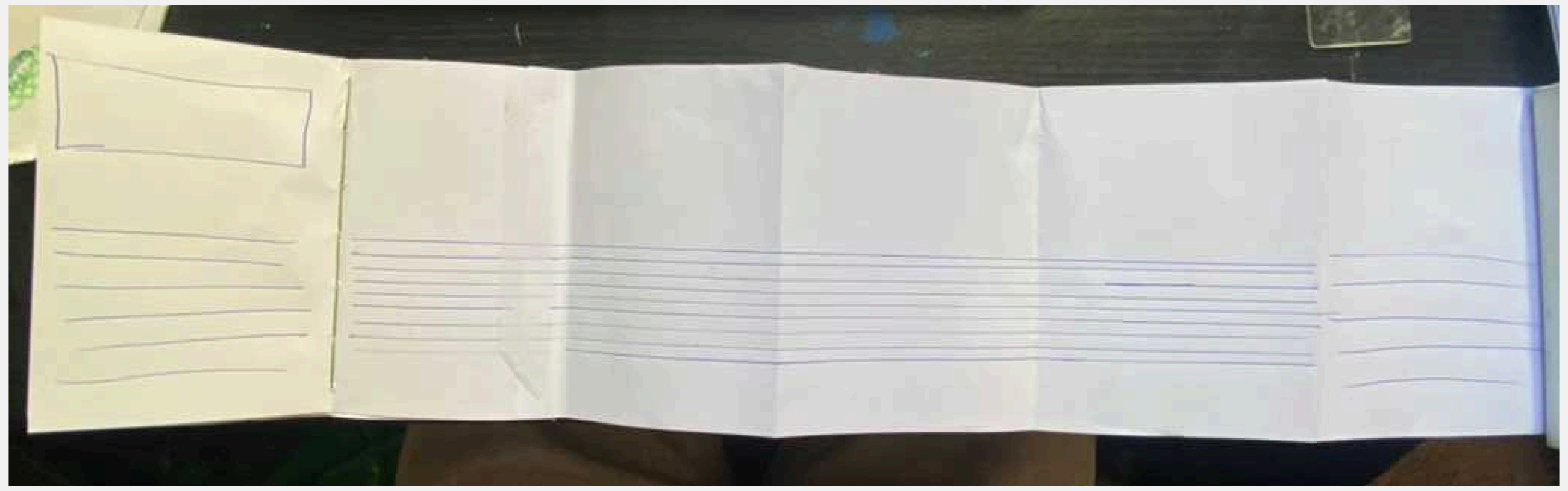


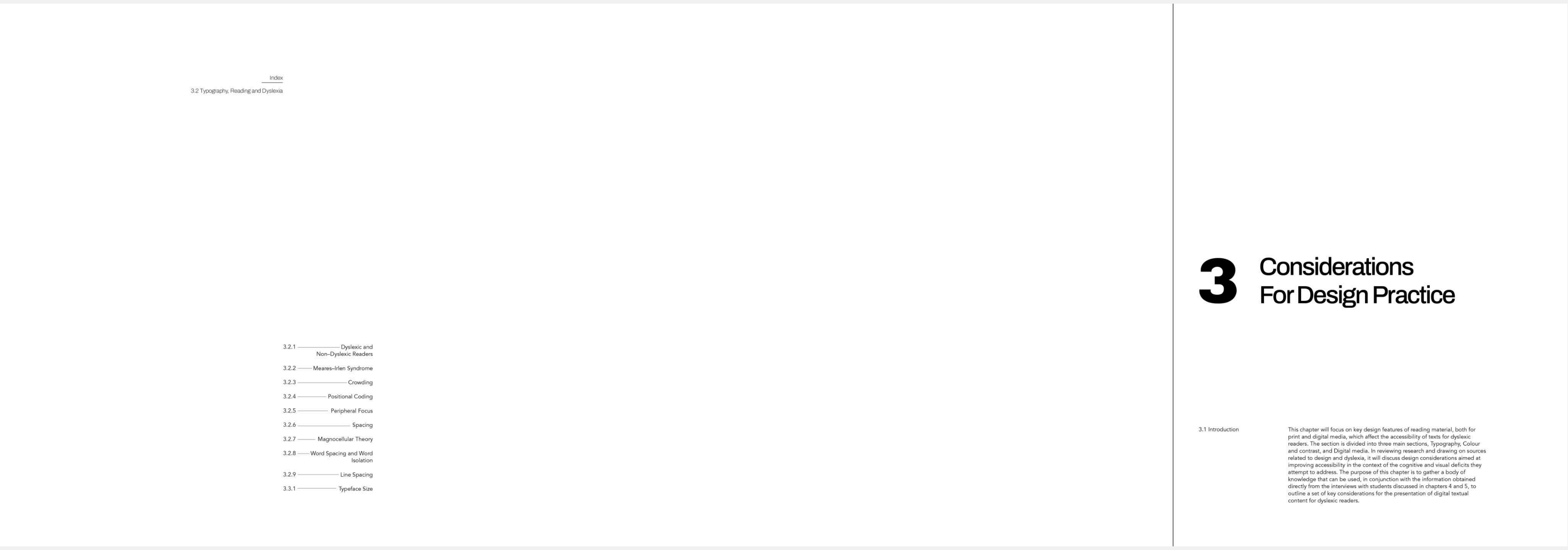


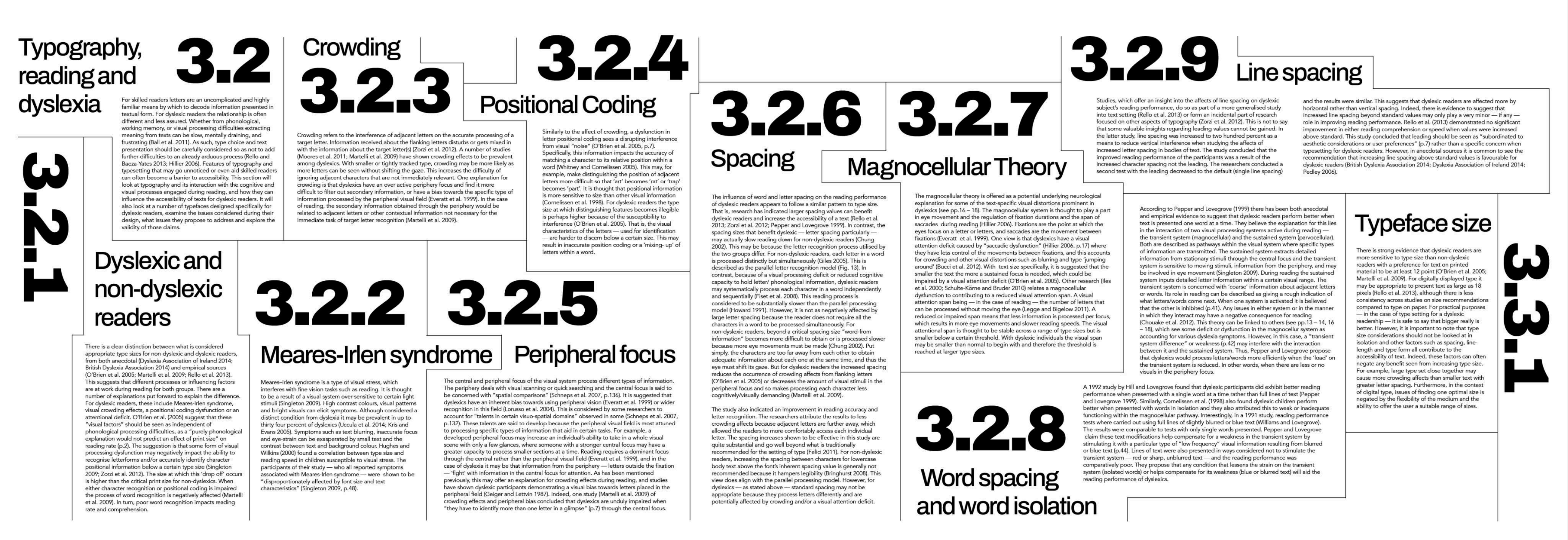
Testing gate folds as a format for full chapters.



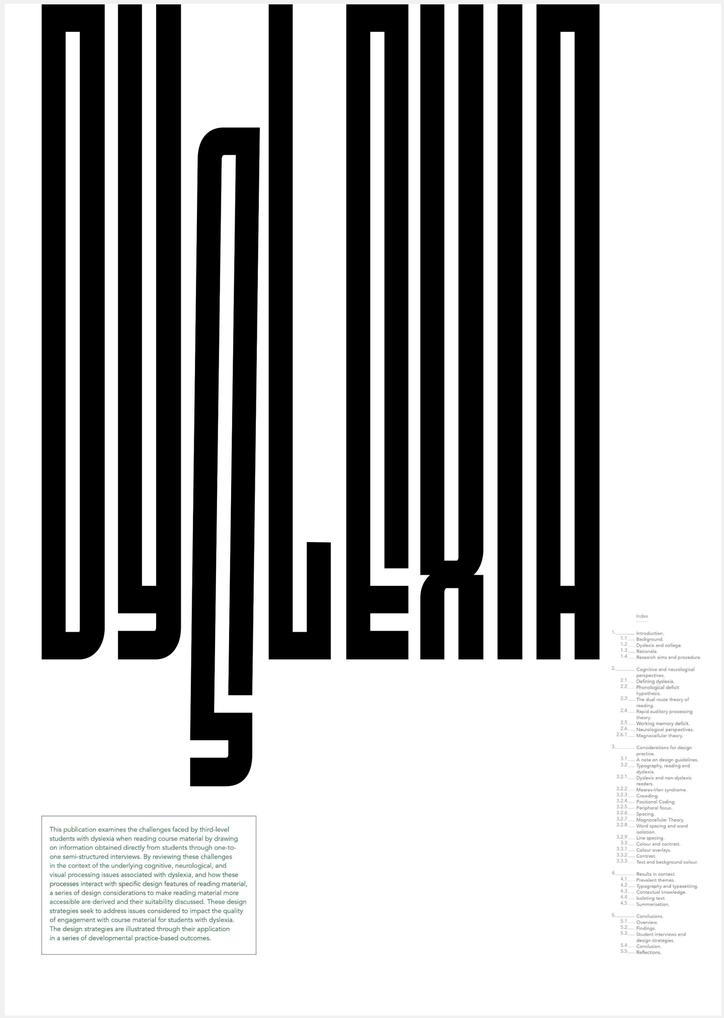


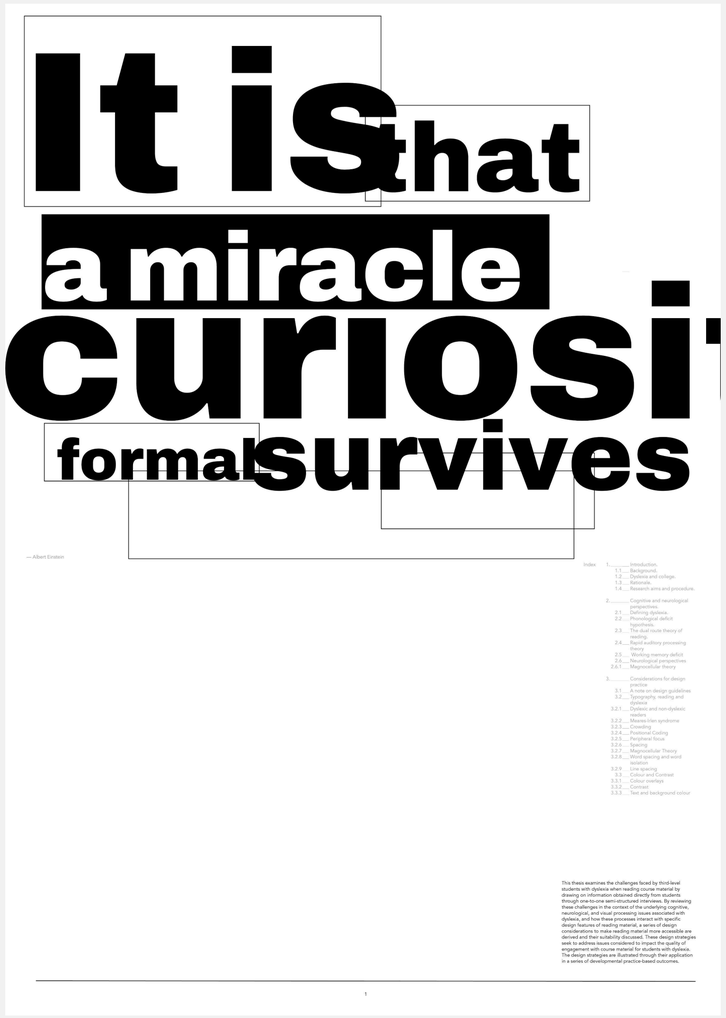


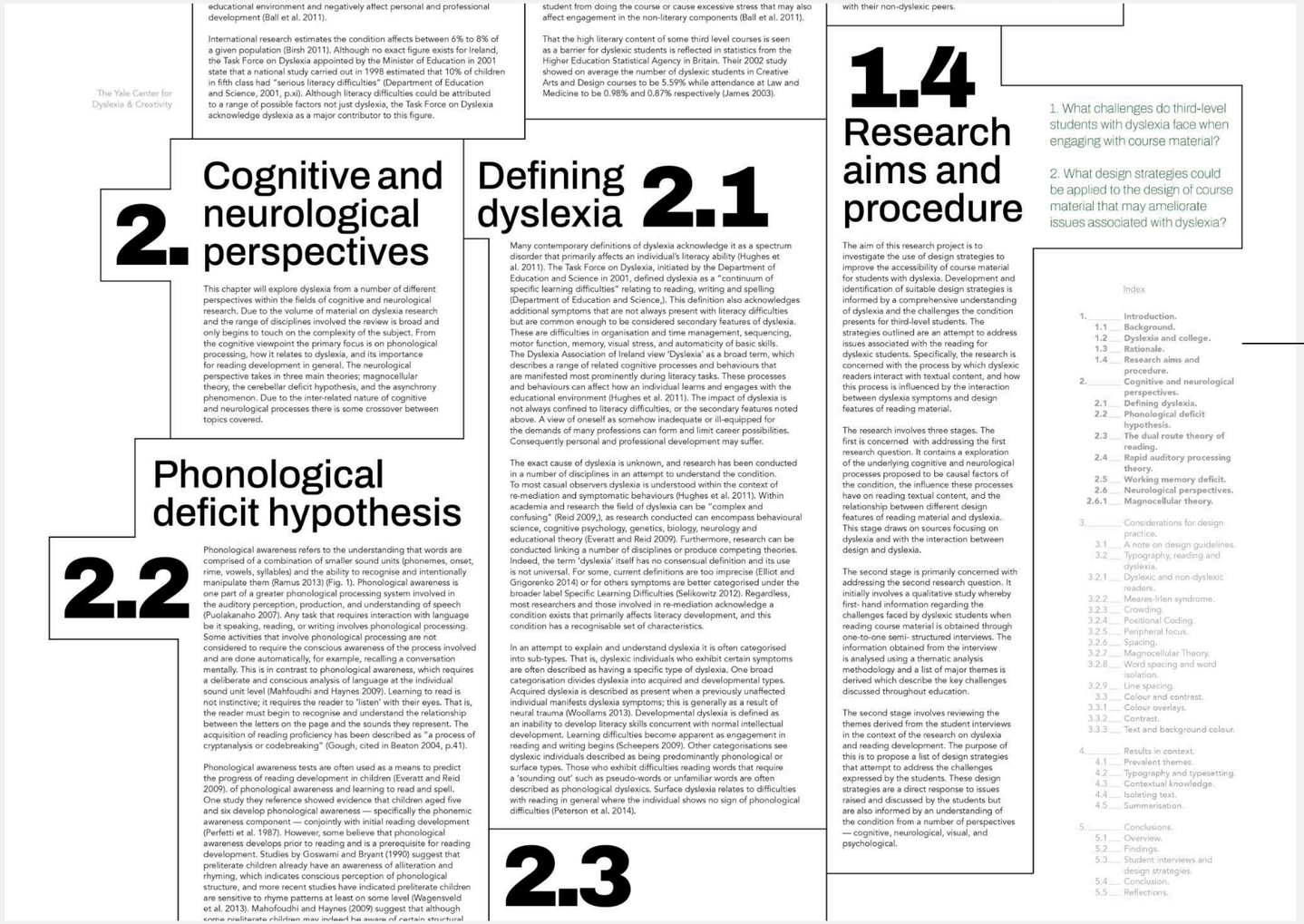





DYSLEXIA
Re-imagining Education for Dyslexics
This publication examines the challenges faced by third-level students with dyslexia when reading course material by drawing on information obtained directly from students through one-to-one semi-structured interviews. By reviewing these challenges in the context of the underlying cognitive, neurological, and visual processing issues associated with dyslexia, and how these processes interact with specific design features of reading material, a series of design considerations to make reading material more accessible are derived and their suitability discussed. These design strategies seek to address issues considered to impact the quality of engagement with course material for students with dyslexia. The design strategies are illustrated through their application in a series of developmental practice-based outcomes.


DYSLEXIA
This publication examines the challenges faced by third-level students with dyslexia when reading course material by drawing on information obtained directly from students through one-to-one semi-structured interviews. By reviewing these challenges in the context of the underlying cognitive, neurological, and visual processing issues associated with dyslexia, and how these processes interact with specific design features of reading material, a series of design considerations to make reading material more accessible are derived and their suitability discussed. These design strategies seek to address issues considered to impact the quality of engagement with course material for students with dyslexia. The design strategies are illustrated through their application in a series of developmental practice-based outcomes.
Index


It is that
a miracle
curiosi
formal survives
— Albert Einstein
Index
This thesis examines the challenges faced by third-level students with dyslexia when reading course material by drawing on information obtained directly from students through one-to-one semi-structured interviews. By reviewing these challenges in the context of the underlying cognitive, neurological, and visual processing issues associated with dyslexia, and how these processes interact with specific design features of reading material, a series of design considerations to make reading material more accessible are derived and their suitability discussed. These design strategies seek to address issues considered to impact the quality of engagement with course material for students with dyslexia. The design strategies are illustrated through their application in a series of developmental practice-based outcomes.



educational environment and negatively affect personal and professional development (Ball et al. 2011).

International research estimates the condition affects between 6% to 8% of a given population (Birsh 2011). Although no exact figure exists for Ireland, the Task Force on Dyslexia appointed by the Minister of Education in 2001 state that a national study carried out in 1998 estimated that 10% of children in fifth class had "serious literacy difficulties" (Department of Education and Science, 2001, p.xi). Although literacy difficulties could be attributed to a range of possible factors not just dyslexia, the Task Force on Dyslexia acknowledge dyslexia as a major contributor to this figure.

The Yale Center for Dyslexia & Creativity

student from doing the course or cause excessive stress that may also affect engagement in the non-literary components (Ball et al. 2011).

That the high literary content of some third level courses is seen as a barrier for dyslexic students is reflected in statistics from the Higher Education Statistical Agency in Britain. Their 2002 study showed on average the number of dyslexic students in Creative Arts and Design courses to be 5.59% while attendance at Law and Medicine to be 0.98% and 0.87% respectively (James 2003).

with their non-dyslexic peers.

2. Cognitive and neurological perspectives

This chapter will explore dyslexia from a number of different perspectives within the fields of cognitive and neurological research. Due to the volume of material on dyslexia research and the range of disciplines involved the review is broad and only begins to touch on the complexity of the subject. From the cognitive viewpoint the primary focus is on phonological processing, how it relates to dyslexia, and its importance for reading development in general. The neurological perspective takes in three main theories; magnocellular theory, the cerebellar deficit hypothesis, and the asynchrony phenomenon. Due to the inter-related nature of cognitive and neurological processes there is some crossover between topics covered.

Defining dyslexia 2.1

Many contemporary definitions of dyslexia acknowledge it as a spectrum disorder that primarily affects an individual's literacy ability (Hughes et al. 2011). The Task Force on Dyslexia, initiated by the Department of Education and Science in 2001, defined dyslexia as a "continuum of specific learning difficulties" relating to reading, writing and spelling (Department of Education and Science,). This definition also acknowledges additional symptoms that are not always present with literacy difficulties but are common enough to be considered secondary features of dyslexia. These are difficulties in organisation and time management, sequencing, motor function, memory, visual stress, and automaticity of basic skills. The Dyslexia Association of Ireland view 'Dyslexia' as a broad term, which describes a range of related cognitive processes and behaviours that are manifested most prominently during literacy tasks. These processes and behaviours can affect how an individual learns and engages with the educational environment (Hughes et al. 2011). The impact of dyslexia is not always confined to literacy difficulties, or the secondary features noted above. A view of oneself as somehow inadequate or ill-equipped for the demands of many professions can form and limit career possibilities. Consequently personal and professional development may suffer.

The exact cause of dyslexia is unknown, and research has been conducted in a number of disciplines in an attempt to understand the condition. To most casual observers dyslexia is understood within the context of re-mediation and symptomatic behaviours (Hughes et al. 2011). Within academia and research the field of dyslexia can be "complex and confusing" (Reid 2009,), as research conducted can encompass behavioural science, cognitive psychology, genetics, biology, neurology and educational theory (Everatt and Reid 2009). Furthermore, research can be conducted linking a number of disciplines or produce competing theories. Indeed, the term 'dyslexia' itself has no consensual definition and its use is not universal. For some, current definitions are too imprecise (Elliot and Grigorenko 2014) or for others symptoms are better categorised under the broader label Specific Learning Difficulties (Selikowitz 2012). Regardless, most researchers and those involved in re-mediation acknowledge a condition exists that primarily affects literacy development, and this condition has a recognisable set of characteristics.

In an attempt to explain and understand dyslexia it is often categorised into sub-types. That is, dyslexic individuals who exhibit certain symptoms are often described as having a specific type of dyslexia. One broad categorisation divides dyslexia into acquired and developmental types. Acquired dyslexia is described as present when a previously unaffected individual manifests dyslexia symptoms; this is generally as a result of neural trauma (Woollams 2013). Developmental dyslexia is defined as an inability to develop literacy skills concurrent with normal intellectual development. Learning difficulties become apparent as engagement in reading and writing begins (Scheepers 2009). Other categorisations see dyslexic individuals described as being predominantly phonological or surface types. Those who exhibit difficulties reading words that require a 'sounding out' such as pseudo-words or unfamiliar words are often described as phonological dyslexics. Surface dyslexia relates to difficulties with reading in general where the individual shows no sign of phonological difficulties (Peterson et al. 2014).

Phonological deficit hypothesis 2.2

Phonological awareness refers to the understanding that words are comprised of a combination of smaller sound units (phonemes, onset, rime, vowels, syllables) and the ability to recognise and intentionally manipulate them (Ramus 2013) (Fig. 1). Phonological awareness is one part of a greater phonological processing system involved in the auditory perception, production, and understanding of speech (Puolakanaho 2007). Any task that requires interaction with language be it speaking, reading, or writing involves phonological processing. Some activities that involve phonological processing are not considered to require the conscious awareness of the process involved and are done automatically, for example, recalling a conversation mentally. This is in contrast to phonological awareness, which requires a deliberate and conscious analysis of language at the individual sound unit level (Mahfoudhi and Haynes 2009). Learning to read is not instinctive; it requires the reader to 'listen' with their eyes. That is, the reader must begin to recognise and understand the relationship between the letters on the page and the sounds they represent. The acquisition of reading proficiency has been described as "a process of cryptanalysis or codebreaking" (Gough, cited in Beaton 2004, p.41).

Phonological awareness tests are often used as a means to predict the progress of reading development in children (Everatt and Reid 2009). of phonological awareness and learning to read and spell. One study they reference showed evidence that children aged five and six develop phonological awareness — specifically the phonemic awareness component — conjointly with initial reading development (Perfetti et al. 1987). However, some believe that phonological awareness develops prior to reading and is a prerequisite for reading development. Studies by Goswami and Bryant (1990) suggest that preliterate children already have an awareness of alliteration and rhyming, which indicates conscious perception of phonological structure, and more recent studies have indicated preliterate children are sensitive to rhyme patterns at least on some level (Wagensveld et al. 2013). Mahofoudhi and Haynes (2009) suggest that although some preliterate children may indeed be aware of certain structural

2.3

1.4 Research aims and procedure

1. What challenges do third-level students with dyslexia face when engaging with course material?

2. What design strategies could be applied to the design of course material that may ameliorate issues associated with dyslexia?

The aim of this research project is to investigate the use of design strategies to improve the accessibility of course material for students with dyslexia. Development and identification of suitable design strategies is informed by a comprehensive understanding of dyslexia and the challenges the condition presents for third-level students. The strategies outlined are an attempt to address issues associated with the reading for dyslexic students. Specifically, the research is concerned with the process by which dyslexic readers interact with textual content, and how this process is influenced by the interaction between dyslexia symptoms and design features of reading material.

The research involves three stages. The first is concerned with addressing the first research question. It contains a exploration of the underlying cognitive and neurological processes proposed to be causal factors of the condition, the influence these processes have on reading textual content, and the relationship between different design features of reading material and dyslexia. This stage draws on sources focusing on dyslexia and with the interaction between design and dyslexia.

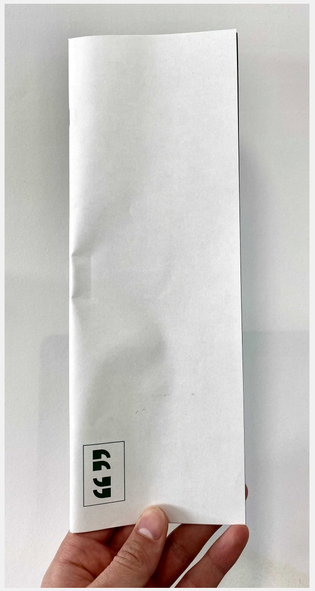
The second stage is primarily concerned with addressing the second research question. It initially involves a qualitative study whereby first- hand information regarding the challenges faced by dyslexic students when reading course material is obtained through one-to-one semi- structured interviews. The information obtained from the interview is analysed using a thematic analysis methodology and a list of major themes is derived which describe the key challenges discussed throughout education.

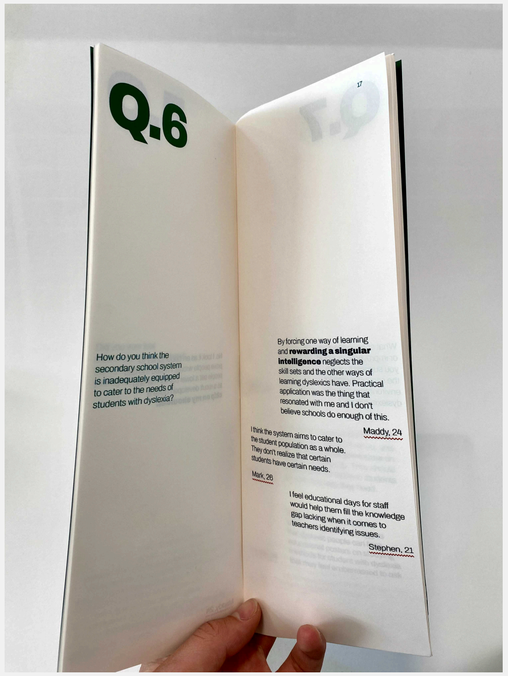
The second stage involves reviewing the themes derived from the student interviews in the context of the research on dyslexia and reading development. The purpose of this is to propose a list of design strategies that attempt to address the challenges expressed by the students. These design strategies are a direct response to issues raised and discussed by the students but are also informed by an understanding of the condition from a number of perspectives — cognitive, neurological, visual, and psychological.

Index

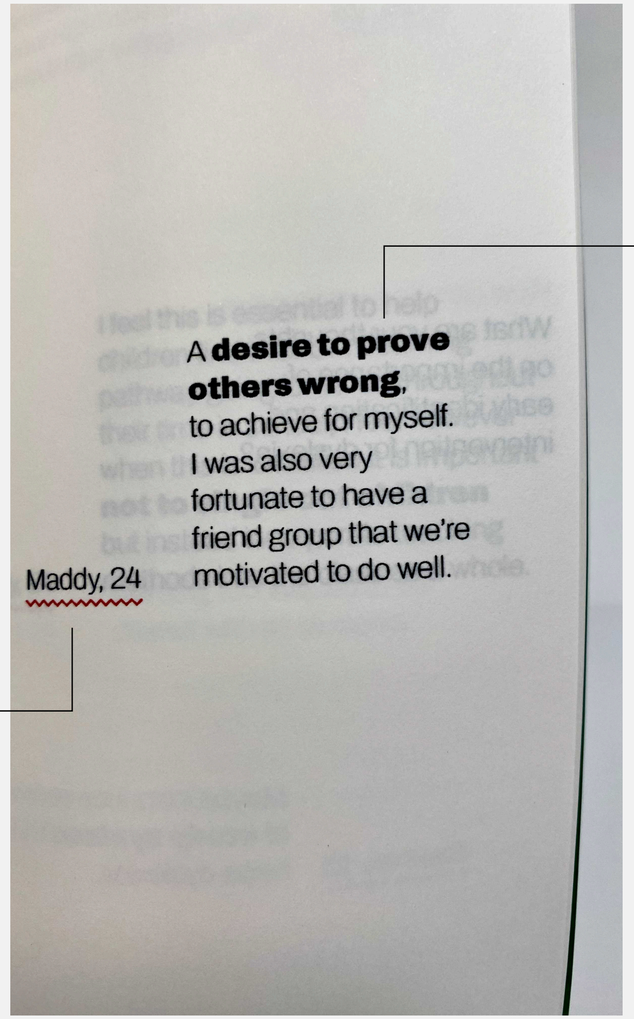
Looking at continuing the index on all spreads to help guide the reader. Using a darker grey to highlight the section of the publication the reader is on.

Interview spreads





Using the convention of the spelling mistake to highlight the interviewee. As this is something we as dyslexics get very used to seeing when writing.



Looking at the see through effect that takes place when printed on a thin paper stock.

I scheduled interviews with people with dyslexia to hear their experiences of going through the educational system.

Final Design Development

Rational

For my ISTD, I decided to focus on the linear way in which the education system teaches students. Currently the way we are taught through a ‘one size fits all’ system of education. Focusing on dyslexic students and how they are an example of one of so many students that do not learn within the boundaries of this linear system.

I have created a comprehensive resource guide for educators, delving into the complexities and challenges faced by dyslexic students within our educational system. By interweaving personal narratives of individuals with dyslexia, in-depth explanations of the underlying biological mechanisms, and a toolkit of effective strategies, this guide empowers educators to create an inclusive learning environment that fosters equal opportunities for dyslexic students to thrive.

I decided on a broadsheet format, with the choice of an unconventional column structure, to emulate a dyslexics feeling of being overwhelmed and confused on where to read next. Each text block is inclosed within lines, so once you are reading your eye doesn’t flow into the wrong text block.

what is it?

It is an expressive educational publication for teachers/lecturers to gain a better understanding of their students. It will be handed out at teaching conferences.

This is just one issue, as there would be a similar book designed for other learning disabilities, ADHD, Dyspraxia etc..

Themes

Hearing from first hand experiences of dyslexic people that have gone through the education system.

Giving practical advice to educators on how dyslexic students think, and providing them with strategies that they can apply to their teaching practices.

Publication

One Size Does Not Fit All

Type

Practical guide for teachers supporting neurodivergent students.

Audience

Educators, Parents and the greater neurodivergent community

Intent

- Inform
- Outlining the struggle of having dyslexia.
- Showing that education system is isolating dyslexic learners
- Offer new perspectives

Tov

- Educational
- Daunting
- Overwhelming
- Unusual
- Personable

Chapter Breakdown

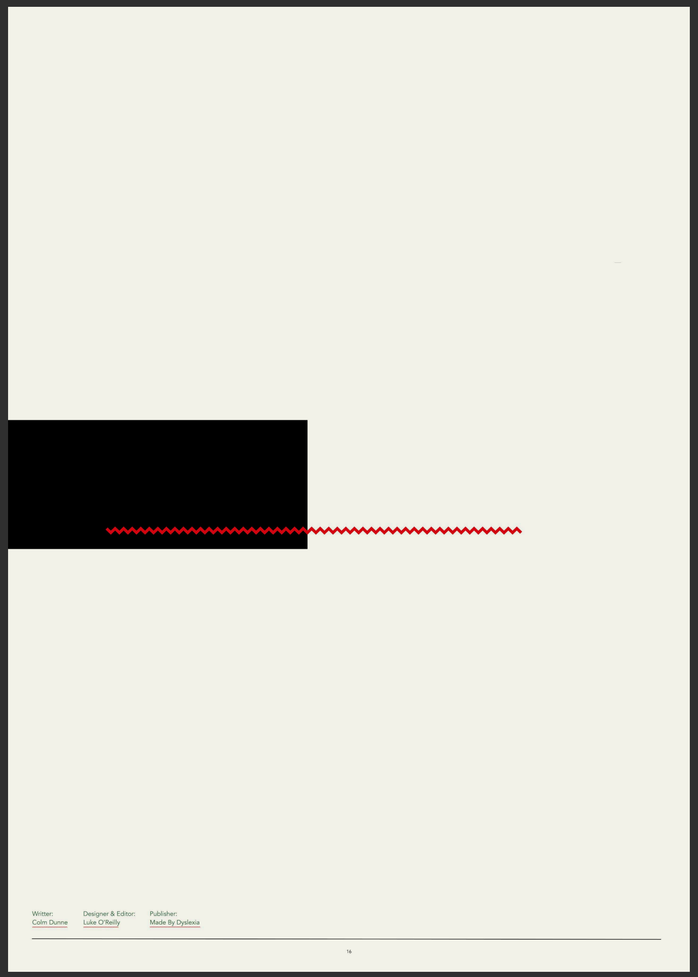
Content

Design Strategies and Dyslexia: Improving the Accessibility of Course Material for Third-level Students with Dyslexia.

Written by: Colum Dunne

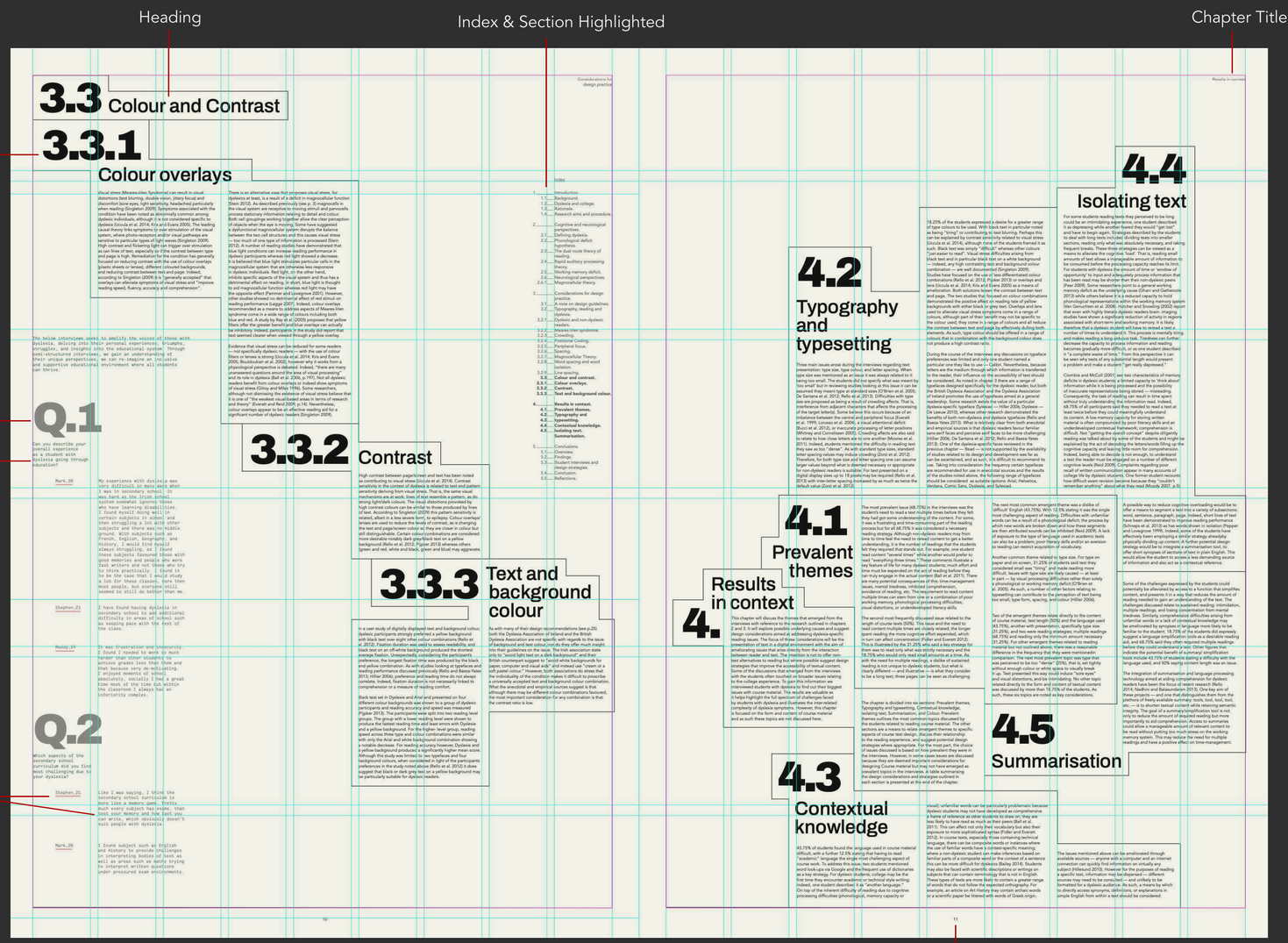
Introduction.
Chapter 2.
Chapter 3.
Chapter 4.

Front cover

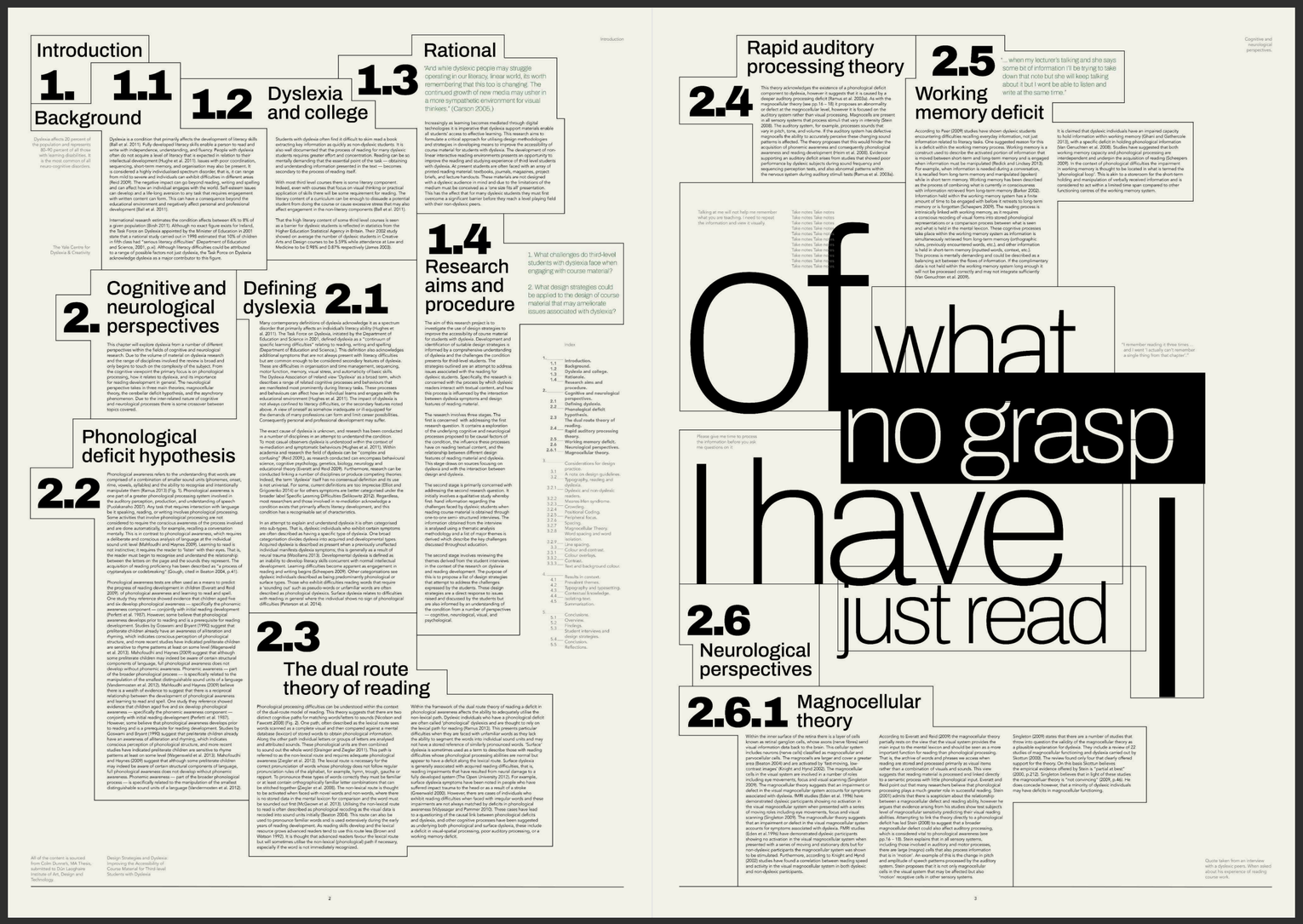


Back cover

Page Components



Page Components



Introduction

1. Introduction

1.1 Background

Dyslexia affects 20 percent of the population and represents 80–90 percent of all those with learning disabilities. It is the most common of all neuro-cognitive disorders.

'The Yale Centre for Dyslexia & Creativity'

Dyslexia is a condition that primarily affects the development of literacy skills (Ball et al. 2011). Fully developed literacy skills enable a person to read and write with independence, understanding, and fluency. People with dyslexia often do not acquire a level of literacy that is expected in relation to their intellectual development (Hughes et al. 2011). Issues with poor coordination, sequencing, short-term memory, and organisation may be present. It is considered a highly individualised spectrum disorder, that is, it can range from mild to severe and individuals can exhibit difficulties in different areas (Reid 2009). The negative impact can go beyond reading, writing and spelling and can affect how an individual engages with the world. Self-esteem issues can develop and a life-long aversion to any task that requires engagement with literacy can occur. This, in turn, can have a consequence beyond the educational environment and negatively affect personal and professional development (Ball et al. 2011).

International research estimates the condition affects between 4% to 8% of a given population (Broli 2011). Although no exact figure exists for Ireland, the Task Force on Dyslexia appointed by the Minister of Education in 2001 state that a national study carried out in 1998 estimated that 10% of children in fifth class had "serious literacy difficulties" (Department of Education and Science, 2001, p.xi). Although literacy difficulties could be attributed to a range of possible factors not just dyslexia, the Task Force on Dyslexia acknowledge dyslexia as a major contributor to this figure.

1.2 Dyslexia and college

Students with dyslexia often find it difficult to skim read a book extracting key information as quickly as non-dyslexic students. It is also well documented that the process of reading for many dyslexic students requires greater effort and concentration. Reading can be so mentally demanding that the essential point of the task — obtaining and understanding information presented in the text — becomes secondary to the process of reading itself.

With most third level courses there is some literary component. Indeed, even with courses that focus on visual thinking or practical application of skills there will be some requirement for reading. The literary component can be a significant barrier for the dyslexic potential student from doing the course or cause excessive stress that may also affect engagement in the non-literary components (Ball et al. 2011).

That the high literary content of some third level courses is seen as a barrier for dyslexic students is reflected in statistics from the Higher Education Statistical Agency in Britain. Their 2002 study showed on average the number of dyslexic students in Creative Arts and Design courses to be 5.59% while attendance at Law and Medicine to be 0.96% and 0.81% respectively (James 2003).

1.3 Rational

"And while dyslexic people may struggle operating in our literacy, linear world, its worth remembering that this too is changing." The continued growth of new media may usher in a more sympathetic environment for visual thinkers." (Carson 2006.)

Increasingly as learning becomes mediated through digital technologies it is imperative that dyslexia support materials enable all students' access to effective learning. This research aims to investigate the challenges faced by dyslexic students themselves and strategies in developing means to improve the accessibility of course material for students with dyslexia. The development of non-linear interactive reading environments presents an opportunity to improve the reading and studying experience of third level students with dyslexia. At present students are often faced with an array of printed reading material: textbooks, journals, magazines, project briefs, and lecture handouts. These materials are not designed with a dyslexic audience in mind and due to the limitations of the medium must be conceived as a 'one size fits all' presentation. This has the effect that for many dyslexic students they must first overcome a significant barrier before they reach a level playing field with their non-dyslexic peers.

2. Cognitive and neurological perspectives

This chapter will explore dyslexia from a number of different perspectives within the fields of cognitive and neurological research. Due to the volume of material on dyslexia research and the range of disciplines involved the review is broad and will not attempt to be exhaustive in any one field of study. From the cognitive viewpoint the primary focus is on phonological processing, how it relates to dyslexia, and its importance for reading development in general. The neurological perspective takes in three main theories; magnocellular theory, the cerebellar deficit hypothesis, and the asynchrony phenomenon. Due to the inter-related nature of cognitive and neurological processes there is some crossover between topics covered.

Defining dyslexia 2.1

Many contemporary definitions of dyslexia acknowledge it as a spectrum disorder that primarily affects an individual's literacy ability (Hughes et al. 2011). The Task Force on Dyslexia, initiated by the Department of Education and Science in 2001, defined dyslexia as a "continuum of specific learning difficulties" relating to reading, writing and spelling (Department of Education and Science,). This definition also acknowledges additional symptoms that are not always present with literacy difficulties but are common enough to be considered secondary features of dyslexia. These include difficulties with organisation, sequencing, short-term memory, motor function, memory, visual stress, and automaticity of basic skills. The Dyslexia Association of Ireland view 'Dyslexia' as a broad term, which describes a range of related cognitive processes and behaviours that are manifested most prominently during literacy tasks. These processes and behaviours can affect how an individual learns and engages with the educational environment (Hughes et al. 2011). The impact of dyslexia is not always confined to literacy difficulties, or the secondary features noted above. A view of oneself as somehow inadequate or ill-equipped for the demands of many professions can form and limit career possibilities. Consequently personal and professional development may suffer.

The exact cause of dyslexia is unknown, and research has been conducted in a number of disciplines in an attempt to understand the condition. To most casual observers dyslexia is understood within the context of re-mediation and symptomatic behaviours (Hughes et al. 2011). Within academia and research the field of dyslexia can be "complex and confusing" (Reid 2009.), as research conducted can encompass behavioural science, cognitive psychology, genetics, biology, neurology and educational theory (Everatt and Reid 2009). Furthermore, research can be conducted linking a number of disciplines or produce competing theories. Indeed, the term 'dyslexia' itself has no consensual definition and its use can be avoided by some researchers in favour of more specific terms (see Grigorenko 2014) or for others symptoms are better categorised under the broader label Specific Learning Difficulties (Selikowitz 2012). Regardless, most researchers and those involved in re-mediation acknowledge a condition exists that primarily affects literacy development, and this condition has a recognisable set of characteristics.

In an attempt to explain and understand dyslexia it is often categorised into sub-types. That is, dyslexic individuals who exhibit certain symptoms are often described as having a specific type of dyslexia. One broad categorisation divides dyslexia into acquired and developmental types. Acquired dyslexia is caused by trauma to the brain and can manifest in individual manifests dyslexia symptoms; this is generally as a result of neural trauma (Woollams 2013). Developmental dyslexia is defined as an inability to develop literacy skills concurrent with normal intellectual development. Learning difficulties become apparent as engagement in reading and writing begins (Schwayen 2009). Other categorisations see dyslexic individuals described as being predominantly phonological or surface types. Those who exhibit difficulties reading words that require a 'sounding out' such as pseudo-words or unfamiliar words are often described as phonological dyslexics. Surface dyslexia relates to difficulties with reading in general where the individual shows no sign of phonological difficulties (Peterson et al. 2014).

1.4 Research aims and procedure

1. What challenges do third-level students with dyslexia face when engaging with course material?

2. What design strategies could be applied to the design of course material that may ameliorate issues associated with dyslexia?

The aim of this research project is to investigate the use of design strategies to improve the accessibility of course material for students with dyslexia. Development and identification of suitable design strategies is informed by a comprehensive understanding of dyslexia and the challenges the condition presents for third-level students. The research is divided into three stages to address issues associated with the reading for dyslexic students. Specifically, the research is concerned with the process by which dyslexic readers interact with textual content, and how this process is influenced by the interaction between dyslexia symptoms and design features of reading material.

The research involves three stages. The first is concerned with addressing the first research question. This stage involves research of the underlying cognitive and neurological processes proposed to be causal factors of the condition, the influence these processes have on reading textual content, and the relationship between different design features of reading material and dyslexia. This stage draws on sources focusing on dyslexia and with the interaction between design and dyslexia.

The second stage is primarily concerned with addressing the second research question. It initially involves a qualitative study whereby first- hand information regarding the challenges faced by dyslexic students when reading course material is obtained through one-to-one semi- structured interviews. The information obtained from the interview is analysed using a thematic analysis methodology and a list of major themes is derived which describe the key challenges discussed throughout education.

The second stage involves reviewing the themes derived from the student interviews in the context of the research on dyslexia and reading development. The purpose of this is to propose a list of design strategies that attempt to address the challenges expressed by the students. These design strategies are a direct response to issues raised and discussed by the students but are also informed by the research findings of the condition from a number of perspectives — cognitive, neurological, visual, and psychological.

2.1 Phonological deficit hypothesis

Phonological awareness refers to the understanding that words are comprised of a combination of smaller sound units (phonemes, onset, rime, syllables) and the ability to identify, manipulate and consciously manipulate them (Ramus 2013) (Fig. 1). Phonological awareness is one part of a greater phonological processing system involved in the auditory perception, production, and understanding of speech (Fuukakinaho 2001). Any task that requires interaction with language be it speaking, reading, or writing involves phonological processing. Some activities that involve phonological processing are not considered to require the conscious awareness of the process involved and are done automatically, for example, recalling a conversation mentally. This is in contrast to phonological awareness, which requires a deliberate and conscious analysis of language at the individual sound level (Wagner and Torgesen 1987). Phonological awareness is not instinctive; it requires the reader to 'listen' with their eyes. That is, the reader must begin to recognise and understand the relationship between the letters on the page and the sounds they represent. The acquisition of reading proficiency has been described as "a process of cryptanalysis or codebreaking" (Gough, cited in Beaton 2004, p.41).

Phonological awareness tests are often used as a means to predict the progress of reading development in children (Everatt and Reid 2009). of phonological awareness and learning to read and spell. One study they reference showed evidence that children aged five and six develop phonological awareness — a phonological awareness component — conjointly with initial reading development (Perfetti et al. 1987). However, some believe that phonological awareness develops prior to reading and is a prerequisite for reading development. Studies by Goswami and Bryant (1990) suggest that preliterate children already have an awareness of alliteration and rhyming, which indicates conscious perception of phonological structure, and more recent studies have indicated preliterate children are sensitive to rhyme patterns at least on some level (Wagenaveld et al. 2013). Mahdoudhi and Haynes (2009) suggest that although some preliterate children may indeed be aware of certain structural components of language, this awareness is not sufficiently developed without phonemic awareness. Phonemic awareness — part of the broader phonological process — is specifically related to the manipulation of the smallest distinguishable sound units of a language (Vandermosten et al. 2012). Mahboudhi and Haynes (2009) believe there is a wealth of evidence to suggest that there is a reciprocal relationship between the development of phonological awareness and learning to read and spell. One study they reference showed evidence that children aged five and six develop phonological awareness — a phonological awareness component — conjointly with initial reading development (Perfetti et al. 1987). However, some believe that phonological awareness develops prior to reading and is a prerequisite for reading development. Studies by Goswami and Bryant (1990) suggest that preliterate children already have an awareness of alliteration and rhyming, which indicates conscious perception of phonological structure, and more recent studies have indicated preliterate children are sensitive to rhyme patterns at least on some level (Wagenaveld et al. 2013). Mahdoudhi and Haynes (2009) suggest that although some preliterate children may indeed be aware of certain structural components of language, this awareness is not sufficiently developed without phonemic awareness. Phonemic awareness — part of the broader phonological process — is specifically related to the manipulation of the smallest distinguishable sound units of a language (Vandermosten et al. 2012).

2.3 The dual route theory of reading

Phonological processing difficulties can be understood within the context of the dual route theory of reading. The theory proposes the existence of two distinct cognitive paths for matching words/letters to sounds (Nicolson and Fawcett 2008) (Fig. 2). One path, often described as the lexical route sees words scanned as a complete visual unit and then compared against a mental database (lexicon) of stored words to obtain phonological information. Along the other path individual letters or groups of letters are analysed and attributed sounds. These phonological units are then combined to sound out the whole word (Grainger and Ziegler 2011). This path is referred to as the non-lexical route and requires adequate phonological awareness (Ziegler et al. 2013). The lexical route is necessary for the correct pronunciation of words whose phonology does not follow regular grapheme-phoneme rules, such as irregular words (e.g., yacht) and words like a sqpuon. To pronounce these types of words correctly they must be familiar (or at least contain orthographically familiar letter combinations that can be stitched together (Ziegler et al. 2000). The non-lexical route is thought to be activated when faced with novel words and non-words, where there is no stored data in the mental lexicon for comparison and the word must be sounded out first (McGeown et al. 2013). Utilising the non-lexical route to read is often described as phonological recoding as the visual data is recoded into sound units initially (Beaton 2004). This route can also be used to pronounce familiar words and is used extensively during the early years of reading development. As reading skills develop and the lexical route becomes established it is used less often (Coltheart, Rastle, Perry, Langdon, and Ziegler 2001). It is thought that advanced readers favour the lexical route but will sometimes utilise the non-lexical (phonological) path if necessary, especially if the word is not immediately recognised.

Within the framework of the dual route theory of reading a deficit in phonological processing would affect the non-lexical route but not the non-lexical path. Dyslexic individuals who have a phonological deficit are often called 'phonological' dyslexics and are thought to rely on the lexical path for reading (Ramus 2013). This presents particular difficulties when they are faced with unfamiliar words as they lack the ability to segment the words into individual sound units and may not have a stored reference of similarly pronounced words. 'Surface' dyslexia is sometimes used as a term to describe those with reading difficulties whose phonological processing abilities are normal but appear to have a deficit along the lexical route. Surface dyslexia is generally associated with acquired reading difficulties, that is, difficulties that manifest after a period of time where reading was a fully developed system (The Open University 2012). For example, surface dyslexia symptoms have been noted in people who have suffered impact trauma to the head or as a result of a stroke (Greenwald 2000). However, there are cases of individuals who exhibit reading difficulties when faced with irregular words and these impairments are not always matched by deficits in phonological awareness (Vidyasagar and Pammer 2010). These cases have lead to a questioning of the causal link between phonological deficits and dyslexia, and other cognitive processes have been suggested as underlying both phonological and surface dyslexia, these include a deficit in visual-spatial processing, poor auditory processing, or a working memory deficit.

Index

All of the content is sourced from Colin Dunne's, IAA Thesis, submitted to Dun Laoghaire Institute of Art, Design and Technology.

Design Strategies and Dyslexia: Improving the Accessibility of Course Material for Third-level Students with Dyslexia

2.4 Rapid auditory processing theory

This theory acknowledges the existence of a phonological deficit component to dyslexia, however it suggests that it is caused by a deeper auditory processing deficit (Ramus et al. 2003a). As with the phonological theory (Ramus 2013) RAPT sees the underlying cause or defect at the magnocellular level, however it is focused on the auditory system rather than visual processing. Magnocells are present in all sensory systems that process stimuli that vary in intensity (Stein 2008). The auditory system, for example, processes sounds that vary in pitch, tone, and volume. If the auditory system has defective magnocells the ability to accurately perceive these changing sound patterns is affected. The theory proposes that this would hinder the acquisition of phonemic awareness and consequently phonological awareness and reading development (Heim et al. 2008). Evidence supporting an auditory deficit arises from studies that showed poor performance by dyslexic subjects during sound frequency and sequencing perception tasks, and also atonomal patterns within the nervous system during auditory stimuli tests (Ramus et al. 2003a).

2.5 Working memory deficit

"... when my lecturer's talking and she says some bit of information it'll be trying to take down that note but she will keep talking about it but I wont be able to listen and write at the same time."

According to Paar (2009) studies have shown dyslexic students encountering difficulties recalling everyday information, not just information related to literacy tasks. One suggested reason for this is a deficit within the working memory process. Working memory is a construct used to describe the activated portion of information that is moved between short-term and long-term memory and is engaged in the manipulation of stored knowledge (Sohlberg and Mateer 2001). For example, when information is needed during a conversation, it is recalled from long-term memory and manipulated (spoken) while in short term memory. Working memory has been described as the process of combining what is currently in consciousness with information retrieved from long-term memory (Baltar 2012). Information held within the working memory system has a finite amount of time to be engaged with before it retreats to long-term memory or is forgotten (Schweyers 2009). The reading process is intrinsically linked with working memory, as it requires a conscious recoding of visual forms into stored phonological representations and the ability to hold information between what is read and what is held in the mental lexicon. These cognitive processes take place within the working memory system as information is simultaneously retrieved from long-term memory (orthographic rules, previously encountered words, etc.), and other information is held in short-term memory (imputed words, context, etc.). This process is mentally demanding and could be described as a balancing act between the flows of information. If the complimentary data is not held within the working memory system long enough it will not be processed correctly and may not integrate sufficiently (Van Geruchten et al. 2009).

It is claimed that dyslexic individuals have an impaired capacity to hold information within working memory (Ghani and Gathercole 2013), with a specific deficit in holding phonological information (Van Geruchten et al. 2008). Studies have suggested that both working memory capacity and phonological processing are interdependent and underpin the acquisition of reading (Schweyers 2009). The phonological component of working memory, also known as working memory is thought to be located in what is termed the 'phonological loop'. This is akin to a storeroom for the short-term holding and manipulation of verbally received information and is considered to act within a limited time span compared to other functioning centres of the working memory system.

Talking at me will not help me remember what you are teaching. I need to repeat the information and view it visually.

Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes Take notes

Please give me time to process the information before you ask me questions on it

Of what no grasp have I just read

"I remember reading it three times ... and I went 'I actually can't remember a single thing from that chapter'."

2.6 Neurological perspectives

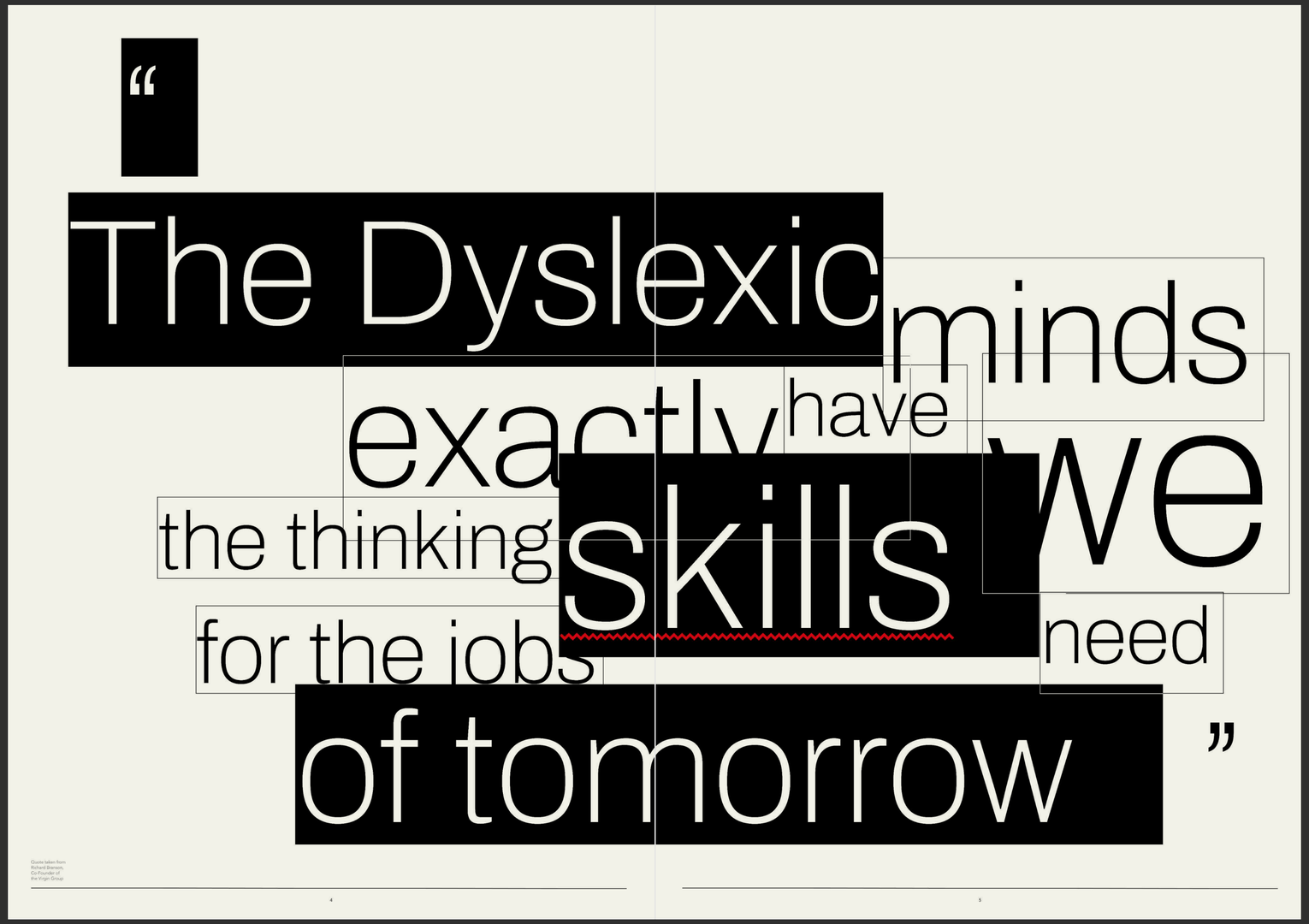
2.6.1 Magnocellular theory

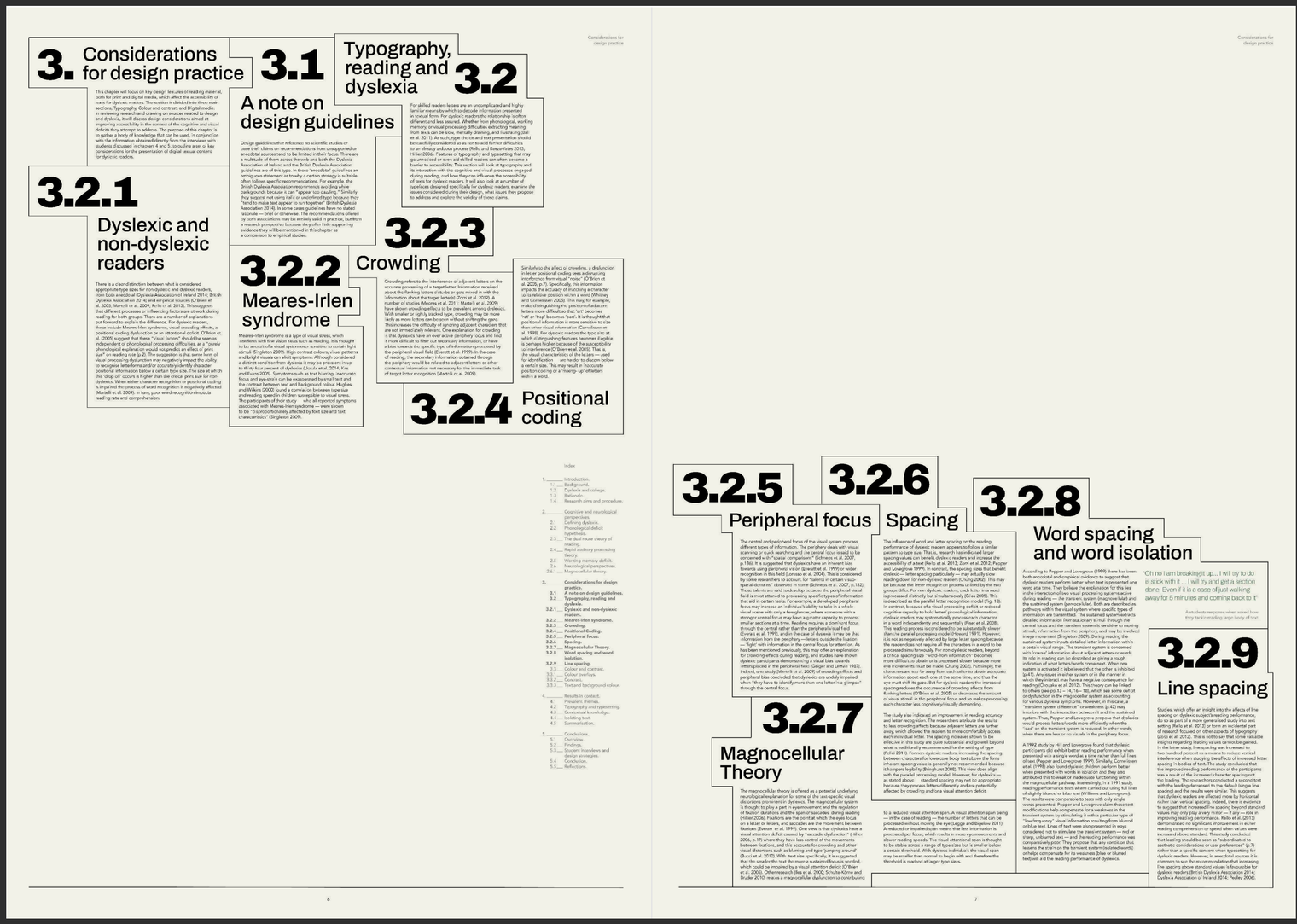
Within the inner surface of the retina there is a layer of cells known as retinal ganglion cells, whose axons (nerve fibres) send visual information back to the brain. This retinal layer includes neurons (nerve cells) classified as magnocellular and parvocellular cells. The magnocells are larger and cover a greater area (Beaton 2004) and are activated by 'fast-moving, low-contrast images' (Knight and Hynd 2002). The magnocellular cells in the visual system are involved in a number of roles, including eye movements, focus and visual scanning (Singleton 2009). The magnocellular theory suggests that an impairment or defect in the visual magnocellular system accounts for symptoms associated with dyslexia. fMRI studies (Eden et al. 1996) have demonstrated dyslexic participants showing no activation in the visual magnocellular system when presented with a series of moving and stationary dots but for non-dyslexic participants the magnocellular system was shown to be stimulated. Furthermore, according to Knight and Hynd (2002) studies there found a correlation between reading speed and activity in the visual magnocellular system in both dyslexic and non-dyslexic participants.

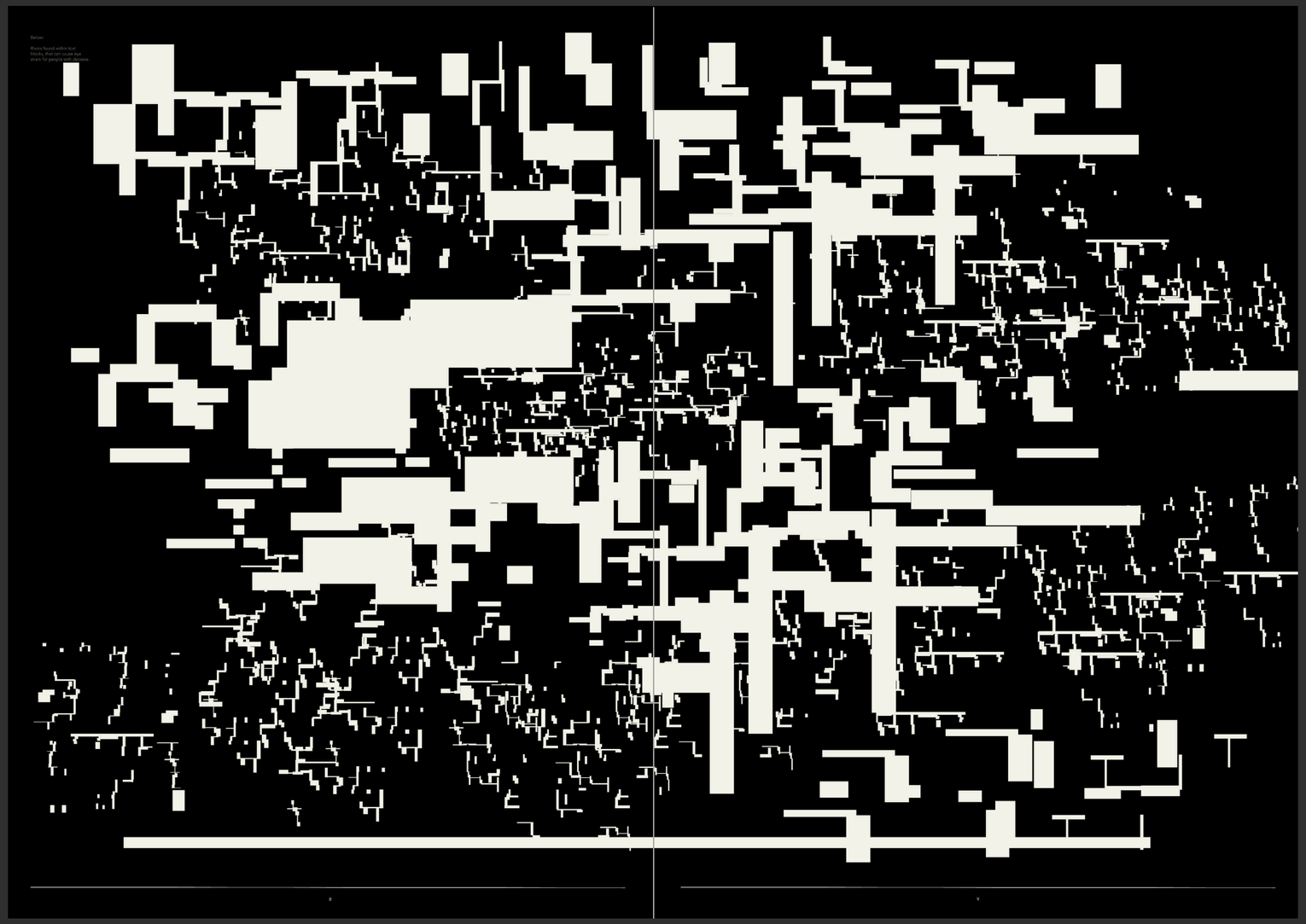
According to Everatt and Reid (2009) the magnocellular theory partially rests on the view that the visual system provides the main input to the mental lexicon and should be seen as a more important function for reading than phonological processing. That is, the archive of words and phrases we access when reading are retrieved and processed primarily as visual items rather than a combination of visuals and sounds. This view contends that reading material is processed and linked directly to a semantic process with little phonological input. Everatt and Reid point out that many researchers believe that phonological processing plays a much greater role in successful reading. Stein (2001) admits that there is scepticism about the relationship between a magnocellular defect and reading ability, however he does believe that there is a causal relationship between the visual magnocellular sensitivity predicting their visual reading abilities. Attempting to link the theory directly to a phonological deficit has led Stein (2008) to suggest that a broader magnocellular defect could also affect auditory processing, which is considered vital to phonological awareness (see pp.16 – 18). Stein explains that in all sensory systems, including those involved in auditory and motor processes, there are large (magno) cells that also process information that is in 'motion'. An example of this is the change in pitch and amplitude over time in patterns processed in the auditory system. Stein proposes that there are magnocellular cells in the visual system that may be affected but also "motion" receptive cells in other sensory systems.

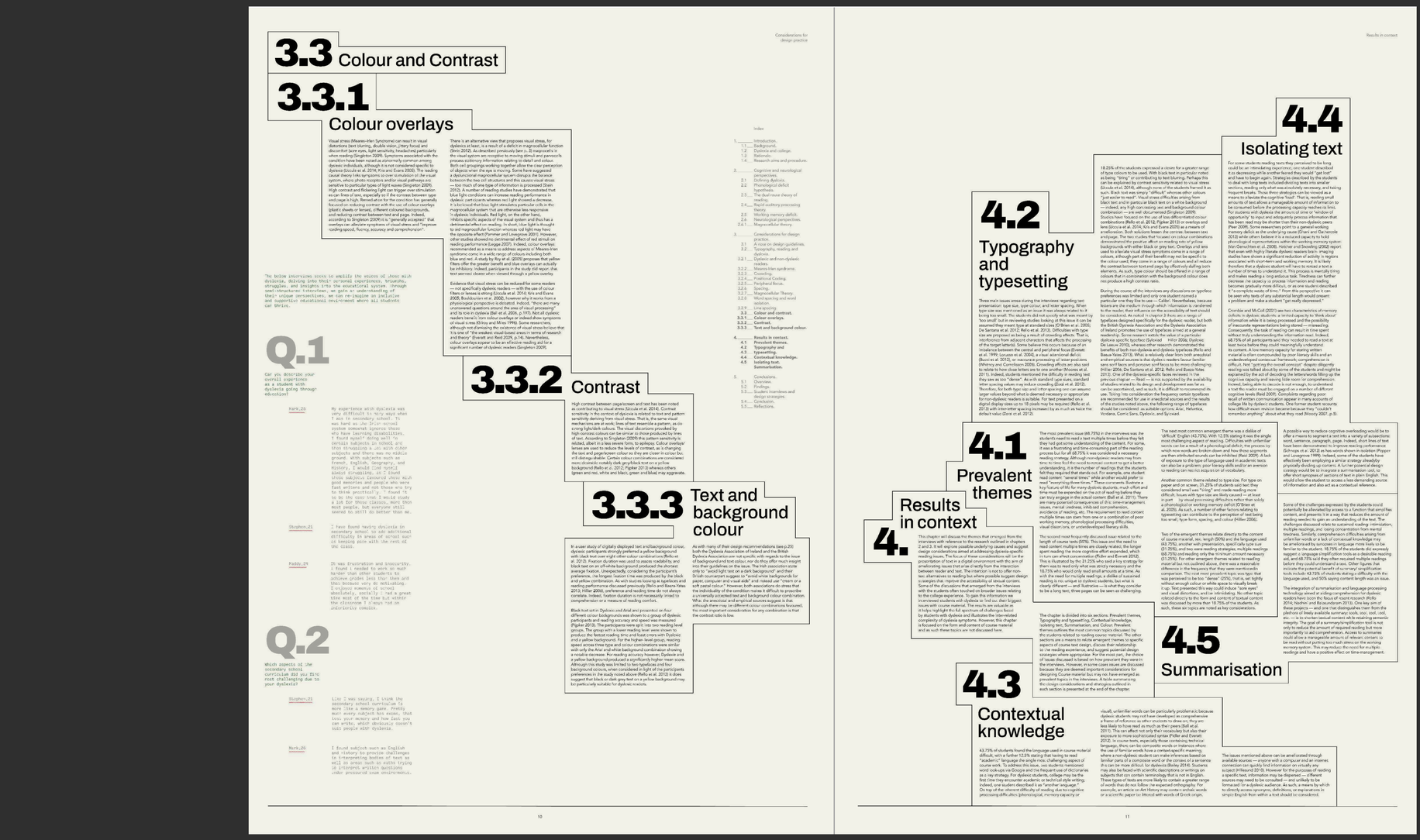
Singleton (2009) states that there are a number of studies that throw into question the validity of the magnocellular theory as a plausible explanation for dyslexia. They include a review of 22 studies of magnocellular functioning and dyslexia carried out by Skottun (2000). The review found only four that clearly offered support for the theory. On this basis Skottun believes the empirical evidence offered by Stein is "partial at best" (2000, p.212). Singleton believes that in light of three studies the magnocellular theory is "not convincing" (2009, p.46). He does concede however, that a minority of dyslexic individuals may have deficits in magnocellular functioning.

Quote taken from an interview with a dyslexic peers. When asked about his experience of reading course work.


“
The Dyslexic minds
exactly have
the thinking skills we
for the jobs need
of tomorrow
”
Quote taken from
Richard Branson,
Co-Founder of
the Virgin Group
4
5


3. Considerations for design practice
This chapter will focus on key design features of reading material, both for print and digital media, which affect the accessibility of texts. Specific attention will be given to the areas of Typography, sections, Typography, Colour and contrast, and Digital media considerations. Research and drawing on sources related to design and dyslexia, it will discuss design considerations aimed at improving accessibility in the context of the cognitive and visual deficits they attempt to address. The purpose of this chapter is to gather a body of knowledge that can be used, in conjunction with the information obtained directly from the interviews with students discussed in chapters 4 and 5, to outline a set of key considerations for the presentation of digital textual content for dyslexic readers.
3.1 A note on design guidelines
Typography, reading and dyslexia
3.2
3.2.1 Dyslexic and non-dyslexic readers
There is a clear distinction between what is considered appropriate type sizes for non-dyslexic and dyslexic readers, from both anecdotal (Dyslexia Association of Ireland 2014; British Dyslexia Association 2014) and empirical sources (O'Brien et al. 2005; Martelli et al. 2009; Arditi et al. 2013). This suggests that different processes or influencing factors are at work during reading for the two groups. The following sections will explore and put forward to explain the difference. For dyslexic readers, these include Meares-Irlen syndrome, visual crowding effects, a positional coding dysfunction or an attentional deficit. O'Brien et al. (2005) suggest that these "visual factors" should be seen as independent of phonological processing difficulties, as a "purely phonological explanation would not predict an effect of 'print size'" on reading rate (p.2). The suggestion is that some form of visual processing dysfunction may negatively impact the ability to recognise letterforms and/or accurately identify character positional information below a certain type size. The size at which this effect begins to affect reading rate is smaller for non-dyslexics. When either character recognition or positional coding is impaired the process of word recognition is negatively affected (Martelli et al. 2009). In turn, poor word recognition impacts reading rate and comprehension.
3.2.2 Meares-Irlen syndrome
Meares-Irlen syndrome is a type of visual stress, which "describes the perceptual distortions that readers may experience" (Singleton 2009). High contrast colours, visual patterns and bright visuals are elicit symptoms. Although considered a distinct condition from dyslexia it may be prevalent in up to thirty four percent of dyslexics (Lizuka et al. 2014; Kriss and Evans 2005). Symptoms such as text blurring, inaccurate focus and eye-strain can be exacerbated by small text and the contrast between text and background colour. Hughes and Wilkins (2000) found a correlation between type size and reading speed in children susceptible to visual stress, with Singleton (2009) noting that "...reported symptoms associated with Meares-Irlen syndrome ... were also known to be "disproportionately affected by font size and text characteristics" (Singleton 2009).
3.2.3 Crowding
Crowding refers to the interference of adjacent letters on the accurate processing of a target letter. Information received about the flanking letters disturbs or gets mixed in with the information about the target letter(s) (Zorzi et al. 2012). A number of studies (Moores et al. 2011; Martelli et al.; 2009) have shown crowding effects to be prevalent among dyslexics. With smaller or tightly stacked type, crowding may be more likely as more letters can be seen without shifting the gaze. This increases the difficulty of ignoring adjacent characters that are not immediately relevant. One explanation for crowding is that dyslexics have an over active peripheral focus and find it difficult to inhibit it (Zorzi et al. 2012). Another is that it has a bias towards this specific type of information processed by the peripheral visual field (Everett et al. 1999). In the case of reading, the secondary information obtained through the periphery would be related to adjacent letters or other contextual information not necessary for the immediate task of target letter recognition (Martelli et al. 2009).
Similarly to the effect of crowding, a dysfunction in letter positional coding sees a distracting interference from visual "noise" (O'Brien et al. 2005, p.7). Specifically, this information impacts the accuracy of matching a character to its relative position within a word (Whitney and Cornelissen 2005). This may, for example, make distinguishing the position of adjacent letters more difficult so that 'left' becomes 'flet'. Bouma (1973) found as far back as 1973 that positional information is more sensitive to size than other visual information (Cornelissen et al. 1998). For dyslexic readers the type size at which distinguishing features becomes illegible is perhaps higher because of the susceptibility to interference (O'Brien et al. 2005). That is, the visual characteristics of the letters — used for identification — are harder to discern below a certain size. This may result in inaccurate position coding or a 'mixing-up' of letters within a word.
3.2.4 Positional coding
Index
1. Introduction.
1.1. Dyslexia.
1.2. Dyslexia and college.
1.3. Rational.
1.4. Research aims and procedure.
2. Cognitive and neurological perspectives.
2.1. Defining dyslexia.
2.2. Phonological deficit hypothesis.
2.3. The dual route theory of reading.
2.4. Rapid auditory processing theory.
2.5. Working memory deficit.
2.6. Neurological perspectives.
2.6.1. Magnocellular theory.
3. Considerations for design practice.
3.1. A note on design guidelines.
3.2. Typography, reading and dyslexia.
3.2.1. Dyslexic and non-dyslexic readers.
3.2.2. Meares-Irlen syndrome.
3.2.3. Crowding.
3.2.4. Positional Coding.
3.2.5. Peripheral focus.
3.2.6. Spacing.
3.2.7. Magnocellular Theory.
3.2.8. Word spacing and word isolation.
3.2.9. Line spacing.
3.3. Colour and contrast.
3.3.1. Colour overlays.
3.3.2. Contrast.
3.3.3. Text and background colour.
4. Results in context.
4.1. Prevalent themes.
4.2. Typography and typesetting.
4.3. Contextual knowledge.
4.4. Isolating text.
4.5. Summarisation.
5. Conclusions.
5.1. Overview.
5.2. Findings.
5.3. Student interviews and design strategies.
5.4. Conclusion.
5.5. Reflections.
3.2.5 Peripheral focus
The central and peripheral focus of the visual system process different types of information. The periphery deals with visual scanning or quick searching and 'the central focus is said to be concerned with "spatial comparisons" (Schneps et al. 2007, p.136). It is suggested that dyslexics have an inherent bias towards using peripheral vision (Everett et al. 1999) or wider recognition in this field (Lorusso et al. 2004). This is considered a "visual deficit" (Stein 2001) or "visual attentional span that is typical of dyslexics" (Kennett in Iovine Buttenga et al. 2007, p.132). These talents are said to develop because the peripheral visual field is most attuned to processing specific types of information that aid in certain tasks. For example, a developed peripheral focus may increase an individual's ability to take in a whole visual scene with only a few glances, where someone with a stronger central focus may have a greater capacity to process smaller sections at a time. Reading requires a constant focus through the central rather than the peripheral visual field (Everes et al. 1999), and in the case of dyslexia it may be this peripheral bias that causes the reading problems — 'fights' with information in the central focus for attention. As has been mentioned previously, this may offer an explanation for crowding effects during reading, and studies have shown dyslexic participants demonstrating a visual bias towards letters placed in the peripheral field (Geiger and Lettvin 1987). Indeed, one study (Martelli et al. 2009) of crowding effects and peripheral bias concluded that dyslexics are unduly impaired when "they have to identify more than one letter in a glimpse" through the central focus.
3.2.6 Spacing
The influence of word and letter spacing on the reading performance of dyslexic readers appears to follow a similar pattern to type size. That is, research has indicated larger spacing values can benefit dyslexic readers and increase the accessibility of a text (Rello et al. 2013; Zorr et al. 2012; Pauper and Lovegrove 1999). In contrast, the spacing ones that benefit dyslexic — letter spacing particularly — may actually slow down the reading process for non-dyslexics (Zorzi et al. 2012). This may be because the letter recognition process of the two groups differs. For non-dyslexic readers, each letter in a word is processed distinctly but simultaneously (Silva 2005). This is described as the parallel letter recognition model (Fig. 13). In contrast, because of a visual processing deficit or reduced cognitive capacity to hold letters' phonological information, dyslexic readers may systematically process each character in a word independently and sequentially (Fiset et al. 2008). This reading process is considered to be substantially slower than the parallel processing model (Howard 1991). However, for the non-dyslexic reader, the ease with which they can process the reader does not require all the characters in a word to be processed simultaneously. For non-dyslexic readers, beyond a critical spacing size "word-form information" becomes more difficult to obtain or is processed slower because more eye movements must be made (Zorzi 2002). Put simply, the characters are 'too' far away from each other to obtain adequate information about each one at the same time, and thus the eye must shift its gaze. But for dyslexic readers the increased spacing reduces the interference of crowding effects from flanking letters (O'Brien et al. 2005). Or rather, on account of visual stimuli to the periphery focus and so more processing each character was cognitively demanding.
The study also indicated an improvement in reading accuracy and letter recognition. The researchers attribute the results to less crowding effects because adjacent letters are further away, which allowed the readers to more comfortably access each individual letter. The spacing increases shown to be effective in this study are quite substantial and go well beyond the 35% increase recommended by the British Dyslexia Association (Rello et al. 2013). For non-dyslexic readers, increasing the spacing between characters for lowercase body text above the form inherent spacing value is generally not recommended because it hampers legibility (Bringhurst 2008). This view does align with the parallel processing model. However, for dyslexics — as stated above — standard spacing may not be appropriate because they process letters differently and are potentially affected by crowding and/or a visual attention deficit.
3.2.7 Magnocellular Theory
The magnocellular theory is offered as a potential underlying neurological explanation for some of the site-specific visual disorders prominent in dyslexics. The magnocellular system is "the visual system that is responsible for the detection of fast-changing stimuli" (Livingstone et al. 1991). It is also responsible for the control of fixations during reading (Hiller 2006). Fixations are the point at which the eyes focus on a letter or letters, and saccades are the movements between fixations (Everett et al. 1999). One view is that dyslexics have a visual attention deficit caused by "saccadic dysfunction" (Hiller 2006, p.17) where they have less control of the movements between fixations, and this accounts for crowding and other visual distortions such as blurring and type 'jumping around' (Buzzi et al. 2012). With text size specifically, it is suggested that the smaller the text the more a sustained focus is needed, which could be impaired by a visual attention deficit (O'Brien et al. 2005). Other research (Reis et al. 2000; Schulte-Körne and Bruder 2010) makes a magnocellular dysfunction to contributing to a reduced visual attention span. A visual attention span being — in the case of reading — the number of letters that can be processed without moving the eye (Legge and Bigelow 2011). A reduced or impaired span means that less information is processed per focus, which results in more eye movements and slower reading speeds. The visual attentional span is thought to be stable across a range of type sizes but is smaller below a certain threshold. With dyslexic individuals the visual span may be smaller than normal to begin with and therefore the threshold is reached at larger type sizes.
3.2.8 Word spacing and word isolation
According to Pepper and Lovegrove (1999) there has been both anecdotal and empirical evidence to suggest that dyslexic readers perform better when text is presented one word at a time. They believe 'the explanation for this lies in the interaction of two visual processing systems active during reading — the transient system (magnocellular) and the sustained system (parvocellular)' (p.41). These are pathways within the visual system where specific types of information are transmitted. The sustained system extracts detailed information from successive 'snapshots' through the central focus and the transient system is sensitive to moving stimuli, information from the periphery, and may be involved in eye movement (Singleton 2009). During reading the sustained system inputs detailed letter information within a certain visual range. The transient system is concerned with 'coarse' information about adjacent letters or words. Its role in reading can be described as giving a rough indication of where to move the eyes next. When the transient system is activated it is believed that the other is inhibited (p.41). Any issues in either system or in the manner in which they interact may have a negative consequence for reading (Chouake et al. 2012). This theory can be linked to others (see pp.12 – 14, 16 – 18), which see some deficit or dysfunction in the magnocellular system as accounting for various dyslexia symptoms. However, in this case, a "transient system difference" or weakness (p.42) may contribute with the interaction between it and the sustained system. Thus, Pepper and Lovegrove propose that dyslexics have difficulty integrating the information from the 'road' (or the transient system) is received by other means, when there are two or no visuals in the periphery focus.
A 1992 study by Hill and Lovegrove found that dyslexic participants did exhibit better reading performance when presented with a single word at a time rather than full lines of text (Pepper and Lovegrove 1999). Similarly, Cornelissen et al. (1998) also found dyslexic children perform better when presented with words in isolation and they also attributed this to weak or inadequate functioning within the magnocellular system. Stein (2001) found that not only reading performance tests where carried out using full lines of slightly blurred or blue text (Williams and Lovegrove). The results were comparable to tests with only single words presented. Pepper and Lovegrove claim these text modifications help compensate for a weakness in the transient system; by stimulating it with a particular type of "low frequency" visual information resulting from blurred or blue text. Lines of text were also presented in ways considered not to stimulate the transient system — red or sharp, unblurred text — and the reading performance was significantly worse. The blurring or blue text may work to lessens the strain on the transient system (isolated words) or helps compensate for its weakness (blue or blurred text) will aid the reading performance of dyslexics.
"Oh no I am breaking it up... I will try to do as little with it ... I will try and get a section done. Even if it is a case of just walking away for 5 minutes and coming back to it"
A students response when asked how they tackle reading large body of text.
3.2.9 Line spacing
Studies, which offer an insight into the effects of line spacing on dyslexic's reading performance, do so as part of a more generalised study into text setting (Rello et al. 2012) or form an incidental part of research focused on other aspects of typography (Zorzi et al. 2012). This is not to say that some valuable insights regarding leading values cannot be gained. Rello et al. (2013) for example, found that one-and-a-two hundred percent as a means to reduce vertical interference when studying the effects of increased letter spacing in bodies of text. The study concluded that the improved reading performance of the participants was a result of the increased character spacing not the leading. The researchers conducted a second test with the leading decreased to the default (single line spacing) and the results were similar. This suggests that dyslexic readers are affected more by horizontal rather than vertical spacing. Indeed, there is evidence that suggests increasing the leading from the standard values may only play a very minor — if any — role in improving reading performance. Rello et al. (2013) demonstrated no significant improvements in either reading comprehension or speed when values were increased above standard. This study concluded that leading should be seen as "subordinated to aesthetic considerations or user preferences" (p.7) rather than a specific concern when typesetting for dyslexic readers. However, in anecdotal sources it is common to see the recommendation that increasing line spacing above standard values is favourable for dyslexic readers (British Dyslexia Association 2014; Dyslexia Association of Ireland 2014; Pedley 2006).


Below:
Plans found within lost
blocks, that can cause eye
strain for people with dyslexia.



Considerations for design practice

3.3 Colour and Contrast

3.3.1 Colour overlays

Visual stress (Meares-Irlen Syndrome) can result in visual distortions (text blurring, double vision, jittery focus) and discomfort (sore eyes, light sensitivity, headaches) particularly when reading (Singleton 2009). Symptoms associated with the condition have been noted as abnormally common among dyslexic individuals, although it is not considered specific to dyslexia (Lizzola et al. 2014; Kriss and Evans-Jones 2005). The leading causal theory links symptoms to over-stimulation of the visual system, where photo receptors and/or visual pathways are sensitive to particular types of light waves (Singleton 2009). This can be minimised through the use of coloured overlays which re-can lines of text, especially as if the contrast between type and page is high. Remediation for the condition has generally focused on reducing contrast with the use of colour overlays (plastic sheets or lenses), different coloured backgrounds, and reducing contrast between text and page. Indeed, according to Singleton (2009) it is "generally accepted" that overlays can alleviate symptoms of visual stress and "improve reading speed, fluency, accuracy and comprehension".

There is an alternative view that proposes visual stress, for dyslexics at least, is a result of a deficit in magnocellular function (Stein 2012). As described previously (see p. 3) magnocells in the visual system are receptive to moving stimuli and parvocells process stationary information relating to detail and colour. Both cell groupings working together allow the clear perception of objects when the eye is moving. Some have suggested a dysfunctional magnocellular system disrupts the balance between the two cell structures and this causes visual stress — too much of one type of information is processed (Stein 2012). Wilkins (2003) proposed that coloured overlays that blue light conditions can increase reading performance in dyslexic participants whereas red light stimulates particular cells in the magnocellular system that are otherwise less responsive to dyslexic individuals. Red light, on the other hand, inhibits specific aspects of the visual system and thus has a detrimental effect on reading. In short, blue light is thought to aid magnocellular function whereas red light may have the opposite effect (Pammer and Wheatley 2001). However, other studies showed no perceptual effect of red stimuli on reading performance (Kriss et al. 2006). Irlen lenses are also recommended as a means to address aspects of Meares-Irlen syndrome come in a wide range of colours including both blue and red. A study by Ray et al. (2005) proposes that yellow filters offer the greater benefit and blue overlays can actually be inhibitory. Indeed, participants in the study did report (the text seemed) clearer when viewed through a yellow overlay.

Evidence that visual stress can be reduced for some readers through the use of coloured overlays, filters or lenses (Irlen-Filters or lenses is strong (Lizzola et al. 2014; Kriss and Evans-Jones 2005; Bouldoukian et al. 2002), however why it works from a physiological perspective is disputed. Indeed, "there are many unanswered questions around the area of visual processing" and its role in dyslexia (Ball et al. 2006, p.197). Not all dyslexic readers benefit from colour overlays or indeed show symptoms of visual stress (Kriss and Mi-nio 1996). Some researchers, although not dismissing the existence of visual stress believe that it is one of "the weakest visual-based areas in terms of research and theory" (Everett and Reid 2009, p.14). Nevertheless, colour overlays appear to be an effective reading aid for a significant number of dyslexic readers (Singleton 2009).

3.3.2 Contrast

High contrast between page/screen and text has been noted as contributing to visual stress (Lizzola et al. 2014). Contrast sensitivity in the context of dyslexia is related to text and pattern glare, both forms of visual stress. Irlen (1991) claims perceptual overload occurs when contrast between text and background is too strong, e.g. black letters on white paper, or too strong light/dark colours. The visual disorders provoked by too high contrast colours can be similar to those produced by lines of text. According to Singleton (2009) this pattern sensitivity is related, albeit in a less severe form, to epilepsy. Colour overlays/lenses are used to reduce the levels of contrast, as is changing the text and page/screen colour so they are closer in colour but still distinguishable. Certain colour combinations are considered more dramatic-notably dark grey/black text on a yellow background (Bellis et al. 2012; Pighler 2013) whereas others (green and red, white and black, green and blue) may aggravate.

3.3.3 Text and background colour

In a case study of digitally displayed text and background colour, dyslexic participants strongly preferred a yellow background with black text over eight other colour combinations (Bellis et al. 2012). Fixation duration was said to assess readability and black text on an off-white background produced the shortest average fixation. Unexpectedly, considering the participants preference, the longest fixation time was produced by the black text/yellow background. This is contradictory to the speed and reading performance discussed previously (Bellis and Evans-Jones 2013; Hiller 2006), preference and reading time do not always correlate. Indeed, fixation duration is not necessarily linked to comprehension or a measure of reading comfort.

Black text on in Dyslexic and Arial and presented on four different colour backgrounds was shown to a group of dyslexic participants and reading accuracy and speed was measured (Pighler 2013). The participants were split into two reading level groups. The group with a lower reading level were shown to read the Arial presentation faster with the white background and a yellow background. For the higher level group, reading speed across three type and colour combinations were similar with only the Arial and white background combination showing a notable decrease. For reading accuracy however, Dyslexie and a yellow background produced a significantly higher mean score. Although this study was limited to two typefaces and four background colours, when considered in light of the participants preferences in the study noted above (Bellis et al. 2012) it does suggest that black-on-dark grey text on a yellow background may be particularly suitable for dyslexic readers.

As with many of their design recommendations (see p.25) both the Dyslexia Association of Ireland and the British Dyslexia Association are not specific with regards to the issue of background and text colour, nor do they offer much insight into their guidelines on the issue. The Irish association state readers "avoid light text on a dark background" and their British counterpart suggests to "avoid white backgrounds for text and instead use a soft colour". Both do state the benefit of the soft pastel colour." However, both associations do stress that the individuality of the condition makes it difficult to prescribe a universally accepted text and background colour combination. What, the anecdotal and empirical sources suggest is that, although there may be different colour combinations favoured, the most important consideration for any combination is that the contrast ratio is low.

Index

"The below interviews seek to amplify the voices of those with dyslexia, delving into their personal experiences, triumphs, struggles, and insights into the educational system. Through semi-structured interviews, we gain an understanding of their unique perspectives, we can re-imagine an inclusive and supportive educational environment where all students can thrive.

Q.1

Can you describe your overall experience as a student with dyslexia going through education?

Mark,26 — My experience with dyslexia was very difficult in many ways when I was in primary school. I was home schooled, however, the system somewhat ignores those who have learning disabilities. I found myself doing well in certain subjects in school and then struggling a lot with other subjects and there was no middle ground. With subjects such as French, English, Geography, and History, I would find myself getting good grades and really enjoying subjects/general study with good memories and people who were fast writers and not those who try to think prudentially. I found it so in the year that I would study a lot for those classes, more than most people, but everyone still seemed to still do better than me.

Stephen,21 — I have found having dyslexia in secondary school to add additional difficulty in areas of school such as keeping pace with the rest of the class.

Paddy,24 — It was frustration and insecurity. I found I needed to work so much harder than other students to achieve grades less than them and that because very de motivating. I enjoyed summing at school absolutely, similarly I had a great time most of the time but within the classroom I always had an underlying anxiety.

Q.2

Which aspects of the secondary school curriculum did you find most challenging due to your dyslexia?

Stephen,21 — Like I was saying, I think the secondary school curriculum is more like a memory game. Pretty much every subject has exams, that tests your memory and how fast you can write, which obviously doesn't suit people with dyslexia.

Mark,26 — I found subjects such as English and History to provide challenges in interpreting bodies of text as well as areas such as maths trying to interpret written questions under pressurised exam environments.

Results in context

4.4 Isolating text

For some students reading texts they perceived to be long could be an intimidating experience; one student described it as decreasing while another likened they would "get lost" and have to begin again. Strategies described by the students to deal with long texts included dividing texts into smaller sections, reading only what was absolutely necessary, and taking frequent breaks. Those three strategies can be viewed as a means to alleviate the cognitive "load". That is, reading small amounts of text allows a manageable amount of information to be consumed before the processing capacity reaches its limit, while skimming and reading only what is necessary is an opportunity to input and adequately process information that has been read may be shorter than their non-dyslexic peers (Nerr 2008). Some researchers point to a general working memory deficit as the underlying cause (Ghani and Gathercole 2013) while others believe it is a reduced capacity to hold phonological representations within the working memory system (Van Daneshtere et al. 2008). Hatcher and Snowling (2002) report that even with highly literate dyslexic readers brain imaging studies have shown a significant reduction of activity in regions associated with short-term and working memory. It is likely that dyslexic readers require more time to read a text and a number of times to understand it. This process is mentally tiring and makes reading a long arduous task. Tiredness can further decrease the capacity a process information and reading becomes gradually more difficult, or as one student described it "a complete waste of time". From this perspective it can be seen why texts of any substantial length would present a problem and make a student "get really depressed."

Crombie and McColl (2001) see two characteristics of memory deficits in dyslexic students a limited capacity to 'think about' information while it is being processed and the possibility of inaccurate representations being stored — interacting. Consequently, the task of reading can result in time spent without truly understanding the information read. Indeed, 68.75% of all participants said they needed to read a text at least twice before they could meaningfully understand its content. A low memory capacity for storing written material is often compounded by poor literacy skills and an underdeveloped contextual framework; comprehension is difficult. Not "getting the overall concept" despite diligently reading was talked about by some of the students and might be considered as a form of "lost in translation" (see p.24). Even if the cognitive capacity of reading fluent texts for comprehension is lowered, being able to decode is not enough, to understand a text the reader must be engaged on a number of different cognitive levels (Reid 2009). Complaints regarding poor recall of written communication appear in many accounts of college life by dyslexic students. One former student recounts how difficult exam revision became because they "couldn't remember anything" about what they read (Mooney 2007, p.3).

A possible way to reduce cognitive overloading would be to offer a means to segment a text into a variety of a/assections: word, sentence, paragraph, page. Indeed, short lines of text have been demonstrated to improve reading performance (Dyson and Kipping 1998) and reduce reading fatigue (Dyson and Lovegrove 1999). Indeed, some of the students have effectively been employing a similar strategy alreadyby physically dividing up content. A further potential design strategy would be to integrate a summarisation tool, to offer short synopses of sections of text in plain English. This would allow the student to access a less demanding source of information and also act as a contextual reference.

Some of the challenges expressed by the students could potentially be alleviated by access to a function that simplifies content, and presents it in a way that reduces the amount of reading needed to gain an understanding of the text. The challenges discussed relate to sustained reading -intimidation, multiple readings, and vaxing concentration from mental tiredness. Similarly, comprehension difficulties arising from unfamiliar words or a lack of contextual knowledge may be ameliorated by synonyms in language more likely to be familiar to the student. 18.75% of the students did expressly suggest a language simplification tools as a desirable reading aid. This is a figure that is probably conservative in nature before they could understand a text. Other figures that indicate the potential benefit of summary/ simplification tools include: 43.75% of students stating a difficulty with the language used, and 50% saying content length was an issue.

The integration of summarisation and language processing technologies aimed at aiding comprehension for dyslexic readers have been the focus of recent research (Rello et al. 2012; Rello, Ballesteros and Bigham 2015). The results of these reports — and one that distinguishes them from the plethora of freely available summary tools, tool, cool, cool, etc — is to shorten textual content while retaining semantic integrity. The goal of a summary/simplification tool is not only to reduce the amount of required reading but more importantly to aid comprehension. Access to summaries could allow a manageable amount of relevant content to be read without putting too much stress on the working memory system. This may reduce the need for multiple readings and have a positive effect on time-management.

4.2 Typography and typesetting

Three main issues arose during the interviews regarding text presentation: type size, type colour, and letter spacing. When type size was mentioned as an issue it was always known to be too small. The students did not specify what was meant by "small" but from the context it could be inferred that they assumed they meant type at standard size (O'Brien et al. 2005; De Santana et al. 2012; Rello et al. 2013). Difficulties with type size are proposed as being a result of crowding effects. That is, interference from adjacent characters that affects the processing of the target letter(s). Some believe this occurs because of an imbalance between the central and peripheral focus (Everett et al. 1999; Lovasie et al. 2008), a visual attentional deficit (Bucci et al. 2012), or inaccurate processing of letter positions (Whitney and Cornelissen 2005). Crowding effects are also said to relate to how close letters are to one another (Moores et al. 2010). Indeed, participants in the study did report that words they saw as too "dense". As with standard type sizes, standard letter spacing values may induce crowding (Zorzi et al. 2012). Therefore, for both type size and letter spacing one can assume larger values beyond what is deemed necessary or appropriate for non-dyslexic readers is advisable. For text presented on a digital display sizes up to 18 pixels may be required (Rello et al. 2012) with inter-letter spacing increased by as much as twice the default value (Zorzi et al. 2012).

18.25% of the students expressed a desire for a greater range of type colours to be used. With black text in particular noted as being "tiring" or contributing to text blurring. Perhaps this can be explained by contrast sensitivity related to visual stress (Lizzola et al. 2014), although none of the students framed it as such. Black text was simply "difficult" whereas other colours "just easier to read". Visual stress difficulties arising from black text and in particular black text on a white background — indeed, any high contrasting text and background colour combinations — are well documented (Singleton 2009). Studies have focused on the use of less differentiated colour combinations (Rello et al. 2012; Pighler 2013) or overlays and lens (Lizzola et al. 2014; Kris and Evans 2005) as a means of ameliorisation. Both solutions lessen the contrast between text and page. The two studies that focused on colour combinations demonstrated the positive affect on reading rate of yellow backgrounds with either black or grey text. Overlays and lens used to alleviate visual stress symptoms come in a range of colours, although part of their benefit may not be specific to the colour used; they come in a range of colours and all reduce the contrast between text and page to a less harsh level for dyslexic readers. As such, type colour should be offered in a range of colours that in combination with the background colour does not produce a high contrast ratio.

During the course of the interviews any discussions on typeface preferences was limited and only one student named a particular one they like to use — Calibri. Nevertheless, because letters are the medium through which information is transferred to the reader, their influence on the accessibility of text should be considered. As noted in chapter 3 there are a range of typefaces/fonts that claim to be "dyslexic friendly" but both the British Dyslexia Association and the Dyslexia Association of Ireland promotes the use of typefaces a mad at a general readership. Some research extols the value of a particular dyslexia specific typeface (Sylvicad Hiller 2006; Dyslexic De Leeuw 2010), whereas other research demonstrated the benefits of both non-dyslexia and dyslexia typefaces (Rello and Baeza-Yates 2013). What is relatively clear from both anecdotal and empirical sources is that dyslexic readers favour familiar sans-serif fonts and perceive serif-fonts to be more challenging (Hiller 2006; De Santana et al. 2012; Rello and Baeza-Yates 2013). The typeface used in the interviews — Calibri — is a particular chaplain — fitted — is not supported by the availability of studies related to its design and development was far as can be ascertained, and as such, it is difficult to recommend its use. Taking into consideration the frequency certain typefaces are recommended for use in anecdotal sources and the results of the studies noted above, the following range of typefaces should be considered: as suitable options Arial, Helvetica, Verdana, Comic Sans, Dyslexic, and Sylvicad.

4.1 Prevalent themes

The most prevalent issue (68.75%) in the interviews was the student's need to read a text multiple times before they felt they had got some understanding of the content. For some, it was a frustrating and time-consuming part of the reading process but for all (68.75% it was considered a necessary reading strategy. Although non-dyslexic readers may from time to time feel the need to reread content to get a better understanding, it is the number of readings that the students felt they had to engage in that is of significance. Some had to read content "several times" while another would prefer to read "everything three times." These comments illustrate a key feature of life for many dyslexic students; much effort and time must be expended on the act of reading before they can truly engage in the actual content (Ball et al. 2011). There are many potential consequences of this: time-management issues, mental tiredness, inhibited comprehension, avoidance of reading, etc. The requirement to read content multiple times can stem from one or a combination of poor working memory, phonological processing difficulties, visual discrimi-ons, or underdeveloped literacy skills.

The second most frequently discussed issue related to the length of course texts (50%). This issue and the need to read content multiple times are closely related; the longer spent reading the more cognitive effort expended, which in turn can affect concentration (Fidler and Everett 2012). This is illustrated by the 31.25% who said a key strategy for them was to read only what was strictly necessary and the 18.75% who would only read small amounts at a time. As with the need for multiple readings, a dislike of sustained reading is not unique to dyslexic students but it is clearly different — and illustrative — is what they consider to be a long text; three pages can be seen as challenging.

The chapter is divided into six sections: Prevalent themes, Typography and typesetting, Contextual knowledge, Isolating text, Summarisation, and Colour. Prevalent themes outlines the most common topics discussed by the students in relation to reading and studying. The other sections are a means to relate emergent themes to specific aspects of course text design, discuss their relationship to the reading experience, and suggest potential design strategies where appropriate. For the most part, the choice of issues discussed is based on how prevalent they were in the interviews. However, in some cases issues are discussed because they are deemed important considerations for designing Course material but may not have emerged as prevalent topics in the interviews. A table summarising the design considerations and strategies outlined in each section is presented at the end of the chapter.

4.3 Contextual knowledge

43.75% of students found the language used in course material difficult, with a further 12.5% stating their texting to read "academic" language the single most challenging aspect of reading. This is a figure that echoes the issues surrounding word cut-ups via Google and the frequent use of dictionaries as a key strategy. For dyslexic students, college may be the first time they encounter academic or technical style writing; indeed, one student described it as "another language." On top of the inherent difficulty of reading due to cognitive processing difficulties (phonological, memory capacity or visual), unfamiliar words can be particularly problematic because dyslexic students may not have developed a comprehensive a frame of reference as other students to draw on; they are less likely to have read as much as their peers (Ball et al. 2011). This can affect not only their vocabulary but also their exposure to more sophisticated syntax (Fidler and Everett 2012). In course texts, especially those containing technical language, there can be compounds words or instances where the use of familiar words have a context-specific meaning, where a non-dyslexic student can make inferences based on familiar parts of a compound word or the context of a sentence but a dyslexic student may struggle to do so. Dyslexic students may also be faced with scientific descriptions or writings on subjects that can contain terminology that is not in English. These types of texts are more likely to contain a greater range of words that do not follow the expected orthography. For example, an article on Art History may contain archaic words or a scientific paper be littered with words of Greek origin.

The next most common emergent theme was a dislike of 'difficult' English (43.75%). With 12.5% stating it was the single most challenging aspect of reading. Difficulties with unfamiliar words can be a result of a phonological deficit, the process by which unfamiliar words are decoded is slow and laborious, are then attributed sounds can be inhibited (Reid 2009). A lack of exposure to the type of language used in academic texts can also be a problem; poor literacy skills and/or an aversion to reading can restrict acquisi-on of vocabulary.

Another common theme related to type size. For type on paper and on screen, 31.25% of students said text they considered small was "tiring" and made reading more difficult. Issues with type size are likely caused — at least in part — by visual processing difficulties related to sensitivity to chromatic contrast (Singleton 2009; O'Brien et al. 2005). As such, a number of other factors relating to typesetting can contribute to the perception of text being too small; type form, spacing, and colour (Hiller 2006).

Two of the emergent themes relate directly to the content of course material, text length (50%) and the language used (43.75%), another with presentation, specifically type size (31.25%), and two were reading strategies, multiple readings (68.75%) and reading only the minimum amount necessary (31.25%). The interrelationship between the various issues material but not outlined above, there was a reasonable difference in the frequency that they were mentioned as comparison. The most prevalent topic was topic that was perceived to be too "dense" (25%), that is, set tightly without enough colour or white space to visually break it up. Text presented this way could induce "sore eyes" and visual distortions, and be intimidating. No other topic related directly to the form and content of textual content was discussed by more than 18.75% of the students. As such, these six topics are noted as key considerations.

4.5 Summarisation

The issues mentioned above can be ameliorated through available sources — anyone with a computer and an internet connection can access a free online summary tool, a quick search in Record 23:0. However for the purposes of reading a specific text, information may be dispersed — different sources may need to be consulted — and unlikely to be formulated for a dyslexic audience. As such, a means by which to directly access synonyms, definitions, or explanations in simple English from within a text should be considered.

The issues mentioned above can be ameliorated through available sources — anyone with a computer and an internet connection can access a free online summary tool, a quick search in Record 23:0. However for the purposes of reading a specific text, information may be dispersed — different sources may need to be consulted — and unlikely to be formulated for a dyslexic audience. As such, a means by which to directly access synonyms, definitions, or explanations in simple English from within a text should be considered.


Considerations for design practice
Q.3
How did your teachers generally respond to your dyslexia? Were they understanding and supportive, or did you encounter any challenges in getting the necessary support?
Stephen,21
Mark,26
Paddy,24
Q.4
Were there any specific teaching methods or strategies that you used that were particularly helpful for you as a student with dyslexia?
Stephen,21
Mark,26
Paddy,24
Using a coloured piece of acetate can help change the harsh contrast of black text on white paper, to a coloured background. This can stop the strobe like effect caused by that contrast
Highlighter, and readers small batches.
Q.5
How did your dyslexia affect your self-esteem and confidence in your academic abilities?
Stephen,21
Mark,26
Paddy,24
on a
is
a
head wreck
screen
Reading
write
bright
Printing out course material can allow you to gain a better grasp of the amount of information you will have to read.
Quote taken from an interview with a dyslexic peer.
Q.6
Did you ever feel discouraged or disengaged from your studies due to your dyslexia? And how?
Stephen,21
Mark,26
Paddy,24
Q.7
How did your dyslexia impact your social interactions and relationships with peers and teachers?
Stephen,21
Mark,26
Paddy,24
Q.8
How do you think the secondary school system is inadequately equipped to cater to the needs of students with dyslexia?
Stephen,21
Mark,26
Paddy,24
12
13

Q.9

What specific changes or improvements would you suggest to make the secondary school environment more dyslexia-friendly?

Stephen_21 — Education of other students and teachers on the struggles dyslexic students face. Maybe some educational posters on studying methods for student with dyslexia that may feel embarrassed to ask.

Mark_26 — Encourage real world application. Facilitate diversity learning days where people share their different tactics such as mind maps.

Maddy_24 — They should address that students are both intro and extroverted, and not put too much pressure on students to speak up. They should address who the dyslexic students are and what help they need.

Q.10

What are your thoughts on the importance of early identification and intervention for dyslexia?

Stephen_21 — I feel this is essential to help children find their own learning pathway going forwards throughout life. Not just academic life, however when this is identified it is important not to single out children but instead incorporate teaching methods into the class as a whole.

Mark_26 — Very important. It allows you to discover tactics that work well for you and also help normalise having dyslexia.

Maddy_24 — I think the earlier the better. It just hurts a person self confidence when they have to get older and still struggle. And then not know why they are struggling.

Q.11

How can we foster a more inclusive and supportive learning environment for students with dyslexia in secondary schools?

Stephen_21 — Try and spread information and study techniques that may also help student not struggling with dyslexia

Mark_26 — Reduce the focus on test scores and put more emphasis on feedback. It allows people to take the information on board and learn from it. Encourage teachers to up-skill in dyslexic learning techniques to be shared with all students.

Maddy_24 — Maybe introduce some sort of study system that helps people with dyslexia.

5. Conclusions

5.1 Overview

This study was guided by two research questions. The first question aimed to find out what challenges third-level students face when dealing with course material, with a primary focus on reading material. The second question asked what design strategies could be applied to the design of course material that could attempt to ameliorate some of these challenges.

1. What challenges do third-level students with dyslexia face when engaging with course material?
2. What design strategies could be applied to the design of course material that may ameliorate issues associated with dyslexia?

In attempting to address the first question the study initially explored research and literature on the underlying causes of dyslexia and how they manifest as symptoms and relate to engaging with reading material. By examining how a number of cognitive and visual processing issues associated with dyslexia affect the reading process, and how these processes interact with specific design features of reading material, a series of design considerations to make reading material more accessible were derived and their suitability discussed.

Following this initial investigative research phase, a series of interviews with students in third-level were conducted so as to get first-hand information about their experience of engaging with third-level reading material. The interview responses were examined using a thematic analysis methodology and a set of key emergent themes obtained. These themes were then discussed in the context of the research and design considerations outlined in the initial research phase. Following a distillation of the information obtained from the primary and secondary sources a set of design strategies were outlined. These strategies aimed to address the second research question.

The final part of the study involved the application of the design strategies. An animation outlining the features and functionality of a browser based prototype application was created as a means to highlight what design features of reading material — both form and content — should be the focus of accessibility considerations, and a means to illustrate how the design strategies could be integrated into an interactive digital reading environment.

5.2 Findings

From a causal perspective there are three underlying processing difficulties/dysfunctions that have a direct influence on the interaction between the dyslexic reader and textual content. These are a phonological processing deficit, poor working memory, and impaired visual processing, and they are key to understanding why so many people with dyslexia struggle with literacy tasks. It is important to note that not all those who exhibit symptoms associated with dyslexia have all these deficits, dyslexia is a highly individualistic condition and some may only exhibit a mild expression of one of these deficits while others may be severely affected by all three.

Of the three, a phonological processing deficit is considered to be the leading cognitive explanation and the most reliable signifier of the condition. Phonological processing is considered vital to literacy development, especially so at an early age, a deficit/impairment in this area can greatly impact the rate and degree at which reading skills are acquired. Furthermore, a deficit in this area can force an individual to rely on a logographic approach to reading, which places a high level of sound-symbol matching to decode written content. For example, where skilled readers can instinctively break a word down into its constituent phonetic parts and reassemble them to form a coherent phonological unit, dyslexic individuals may have to consciously and deliberately remember that a specific set of letters in a particular arrangement correspond to a certain sound/set of sounds. In short, dyslexic readers often rely on a visual memory of the whole word. This has the effect that unfamiliar words that have not been stored — cannot be read, as there is nothing to reference them against. This can be compounded by underdeveloped literacy skills and less exposure to written content, which results in a limited lexical resource to draw upon.

A working memory deficit describes a difficulty in holding information in the working memory system for an adequate amount of time so as to extract meaning from it. It is considered that a limited working memory capacity reduces the ability to hold information in mind due to a higher cognitive load — the act of reading can be so mentally strenuous that there is less cognitive capacity available for comprehension. This has the effect that dyslexic individuals often have to reread a text multiple times before a sufficient degree of comprehension is attained. Indeed, of the seven key emergent themes from the analysis the need to conduct multiple readings was the most frequently discussed — 68.75% of participants described it as a key challenge.

Unlike both the phonological and working memory deficits, symptoms related to visual processing are not considered as prevalent. However, they are still seen as a significant barrier to reading accessibility for many dyslexics. They have also been the most common focus of design research and applied strategies. Improving the accessibility of textual content for both digital and print media has generally focused on ameliorating visual stress symptoms such as crowding and contrast sensitivity. There are number of key design elements that have been shown to potentially affect of visual stress experienced by the dyslexic reader. These include, type size, letter and word spacing, typeface used, and the contrast ratio between text and background.

Q.12

What role did parents and families play in advocating for their children with dyslexia in secondary school?

Stephen_21 — They were helpful and aware from my view providing testing and support as well as liaising with learning support teachers and staff to make sure all was well.

Mark_26 — A huge role. Without parents lobbying for better learning support I would not have received the help I needed. Additionally my parents were aware of my dyslexia at an early age and sent me to a specific school which was extremely helpful.

Maddy_24 — In my opinion not much. I don't think there's too much they can do.

Q.13

What message would you like to share with policymakers and educational leaders regarding the needs of students with dyslexia in secondary schools?

Stephen_21 — Make it more common knowledge to help and identify many unfounded cases of dyslexia.

Mark_26 — It's important to make learning inclusion a priority. It's important to foster and encourage development in dyslexic students as they have so much to offer in so many different ways.

Maddy_24 — Just that they should address that while some things work for most, they don't work for everyone. And they should try to cater to every student.

Q.14

What advice would you give students that are struggling with being dyslexic within the school system?

Stephen_21 — I would not worry, school at the time feels like the be all end all. However once you finish your leaving cert you realise it doesn't matter and there are many ways to achieve your goal.

Mark_26 — It gets better. Focus on the process not the results. Take time to understand how you learn. You'll have to work harder now but the work ethic you develop will stand to you in later life more than any grades.

Maddy_24 — Just to not give up hope. That being different can actually be a useful tool in the future.

Q.15

What's your favourite thing about being dyslexic?

Stephen_21 — Because of dyslexia I have had to rely on my social skills to get me through situations that were difficult. I am a real peoples person.

Mark_26 — I'm a non- linear thinker which means I'm good at solving issues with creative solutions others don't see.

Maddy_24 — I see the word through a different lens. It allows me to figure out problems in ways that others would never think of. I am highly creative and get a kick from problem solving.

5.3 Student interviews and design strategies

Seven main themes emerged following the analysis of the student interviews:

- Multiple Readings (68.75%)
- Text length (50%)
- 'Dense' text (50%)
- 'Academic' English (43.75%)
- Read minimum amount only (31.25%)
- Type Size (31.25%)
- Use of external references (25%)

The nature of the discussions that informed these themes reflect the underlying causes and key challenges that affect the quality of reading for dyslexic students. Five of the seven themes refer directly to the interaction between reader and content whereas two relate to the presentation of that content. This illustrates that dyslexia affects reading primarily at the cognitive processing stage, that is, the act of reading itself is inhibited and as such design strategies focusing on the presentation of content — the typography, layout, colour, etc. — will only go so far in the accessibility of the content itself — the type of language and words used, the length of a text, familiarity with the subject — as well as the form that content takes. As such, the design strategies outlined can be divided into two categories, those that attempt to address visual processing difficulties, and those whose aim is to aid comprehension and lessen the cognitive effort it takes to extract meaning from a text.

5.4 Conclusion

The design strategies in the first category are focused on the presentation of type and type design, colour, and the amount of viewable content. The typeface and typesetting options are aimed at issues of crowding and text blurring, considered to be a result of a letter positional coding deficit, peripheral focus bias, or a visual attention deficit. These design strategies relate to the themes 'Dense' text and Type size. The colour and opacity customisation strategy is aimed at content sensitivity, which was the most frequently discussed theme to emerge in the interviews it was considered due to their prevalence as a noted feature of dyslexia in the literature that an attempt to address them was deemed appropriate. The text isolation strategy, demonstrated in the prototype as a functionality that allows the user to view one sentence on its own or reduce the amount of text in the text frame, proposes to reduce crowding effects. It is related to the theme 'Dense' text. This strategy is also an attempt to address the intimidation described by a number of the students when they are faced with sustained reading tasks. Intimidation can be a result of a fear of "getting lost" when reading, losing one's place, or it can be a result of having to read a text where a small amount for some of the participants. Therefore, providing a means to present a tailored amount of text can be viewed as a way to alleviate the cognitive 'load' That is, reading small amounts of text allows a manageable amount of information to be consumed before the processing capacity reaches its limit. The strategy to isolate text can therefore be listed under both categories in that it proposes to address visual processing (crowding) and working memory difficulties.

The summarisation, visual network, and complimentary resources strategies are all a means to aid the extraction of meaning from a text and reduce the effort/time it takes a student to read. The complimentary/contextual knowledge sources strategy relates directly to the themes 'Academic' English and Use of external references. The visual network and summarisation strategies also relate to these themes by offering a less involved way to extract a degree of meaning from a text, however they are more likely to reduce the amount of times a student will need to reread a text, rather than the time it takes to read a text. Reading minimum only and Multiple readings. The s not to suggest that giving the reader the option to access alternative words and contextual sources may not reduce the overall reading time but because the other two strategies offer a truncated version or a semi-graphical representation of a text it allows the user access to information which requires less reading.

5.5 Reflections

In reviewing the challenges outlined by the students in the interviews with regards to reading course material and the design strategies proposed to ameliorate some of these challenges it seems apparent that a more holistic approach to designing course material would benefit students with dyslexia and improve the accessibility of reading material. Currently the design of course material is tailored for fully literate students with little or no accommodation made for students with dyslexia. This has the affect that for many they must first overcome a significant barrier before they reach a level playing field with their non-dyslexic peers. In short, they start from further back. Design therefore can be seen as a means to reduce this distance. However, it is important to define design more broadly than just aesthetic form. The major themes that emerged from the interviews clearly illustrate the main challenges faced by the students lie in the process of reading itself and this process can be influenced by cognitive (phonological, working memory), visual (crowding, text blurring, visual stress) and psychological (confidence, intimidation, perceived readability) factors. As such, design needs to consider how to interpret content for dyslexic readers. For example, consideration should be given to visual interpretations, language processing technologies, or alternatives to reading such as audio or film. Furthermore, because digital technology allows the potential for customisation there is now flexibility to how design elements are presented, and as such, visual processing issues can be better addressed than when reading material was restricted to print form. This surely shifts the emphasis away from issues related to visual processing as the primary focus and towards the content itself, and how best to transfer the knowledge contained within a text rather than solely on how the content is presented.

ISTD 2024 Submission

Strategy & Specifications

Project Goals

This platform aims to bridge the gap between educators and the challenges faced by students with dyslexia. By equipping teachers with a deeper understanding of these struggles, we empower them to develop more inclusive teaching methods, ultimately fostering a more adaptable education system that caters to the diverse needs of all students.

Strategy

This book's design intentionally mirrors the experience of information overload some dyslexic individuals face in formal education. The large format, potentially overwhelming typographic layout, and large numeric chapter headings all contribute to this effect. While unconventional, these elements symbolise the rigid structure of the traditional education system that some dyslexic students struggle within.

Context

Education
Accessibility
Neurodivergent

Intent

To raise awareness
To challenge the education system
To give a voice for the students who are still struggling through the system
To give educators an opportunity to adapt their teaching methods.

Tone

Informative, educational, empathetic, honest, empowering, insightful, open-minded, truthful.

Themes

Educational towards people who never had the experience of an education system that was not created for them.
Narrative insights
Visually confontaional

Publication Title

One Size Does Not Fit All

Publication Type

An educational issue on dyslexia, from a publisher that educates on other learning difficulties.

Manifesto

One Size Does Not Fit All is a publication dedicated to the unique challenges faced by students with learning difficulties within the educational system. It offers insights into students' experiences throughout their education, breaking down the specific challenges associated with each learning difficulty.

Typography

Archivo
Archivo is a grotesque sans serif typeface family from Omnibus-Type. It was originally designed for highlights and headlines. This family is reminiscent of late nineteenth century American typefaces.

Avenir
Avenir is a geometric sans-serif typeface designed by Adrian Frutiger in 1987 and released in 1988 by Linotype. Its clean and minimalistic design makes it an appropriate choice as it is easy to read at a small size.

Ballinger Mono
This monospaced version returns the Ballinger family to (some of) its roots: a 70s-era typewriter face called Candia. Ballinger Mono is designed on the same principles as its sister face Ballinger: plain, sturdy forms with large counters, open apertures, deep junctures, and a generous x-height.

Archivo

Avenir

Ballinger Mono

Header Specifications

Use: Chapter section number
Font: Archivo
Weight: Black
Size: 80 pt
Leading: 80 pt
Tracking: -70

2.1

Use: Chapter section headings
Font: Archivo
Weight: Medium
Size: 36pt
Leading: 35pt
Tracking: 0

Defining dyslexia

Use: Pull out quotes/statement/questions
Font: Avenir
Weight: Light
Size: 12pt
Leading: 15pt
Tracking: 0

“when my lecturer is talking and she says some bit of information I’ll be trying to take down that note but she will keep talking about it but I wont be able to listen and write at the same time.”

Paragraph Specifications

Use: Body text
Font: Avenir
Weight: Book
Size: 8pt
Leading: 10 pt
Tracking: 0

Dyslexia is a condition that primarily affects the development of literacy skills (Ball et al. 2011). Fully developed literacy skills enable a person to read and write with independence, understanding, and fluency. People with dyslexia often do not acquire a level of literacy that is expected in relation to their intellectual development (Hughe et al. 2011). Issues with poor coordination, sequencing, short-term memory, and organisation may also be present. It is considered a highly individualised spectrum disorder, that is, it can range from mild to severe and individuals can exhibit difficulties in different areas (Reid 2009). The negative impact can go beyond reading, writing and spelling and can affect how an individual engages with the world. Self-esteem issues can develop and a life-long aversion to any task that requires engagement with written content can form. This can have a consequence beyond the educational environment and negatively affect personal and professional development (Ball et al. 2011).

Use: Interview questions & answers
Font: Ballinger Mono
Weight: Medium
Size: 8pt
Leading: 10pt
Tracking: 0

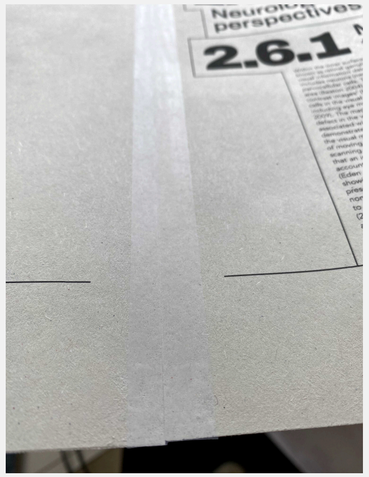
Did you ever feel discouraged or disengaged from your studies due to your dyslexia? And how?

Occasionally I felt frustrated having worked harder than my peers yet receiving lower grades.

Use: Index highlighting section
Font: Avenir
Weight: Black
Size: 8pt
Leading: 10pt
Tracking: 0

4._____Results in context.
4.1____Prevalent themes.
4.2____Typography and typesetting.
4.3____Contextual knowledge.
4.4____Isolating text.
4.5____Summarisation.

Format Specifications



Format & Binding

I chose to use A2 as my format. This decision was made as I wanted to create something that felt just a bit larger than the traditional broadsheet dimensions.
Bound by scotch tape as I was limited with printing options.

Paper

140gsm
White sugar paper

Printing

Using a large ink jet printer to give a similar printed finish to a newspaper.

Colour Palette

C: 0%
M: 0%
Y: 0%
K: 100%

Hex: #000000

C: 0%
M: 0%
Y: 0%
K: 66%

Hex: #D9D9D9

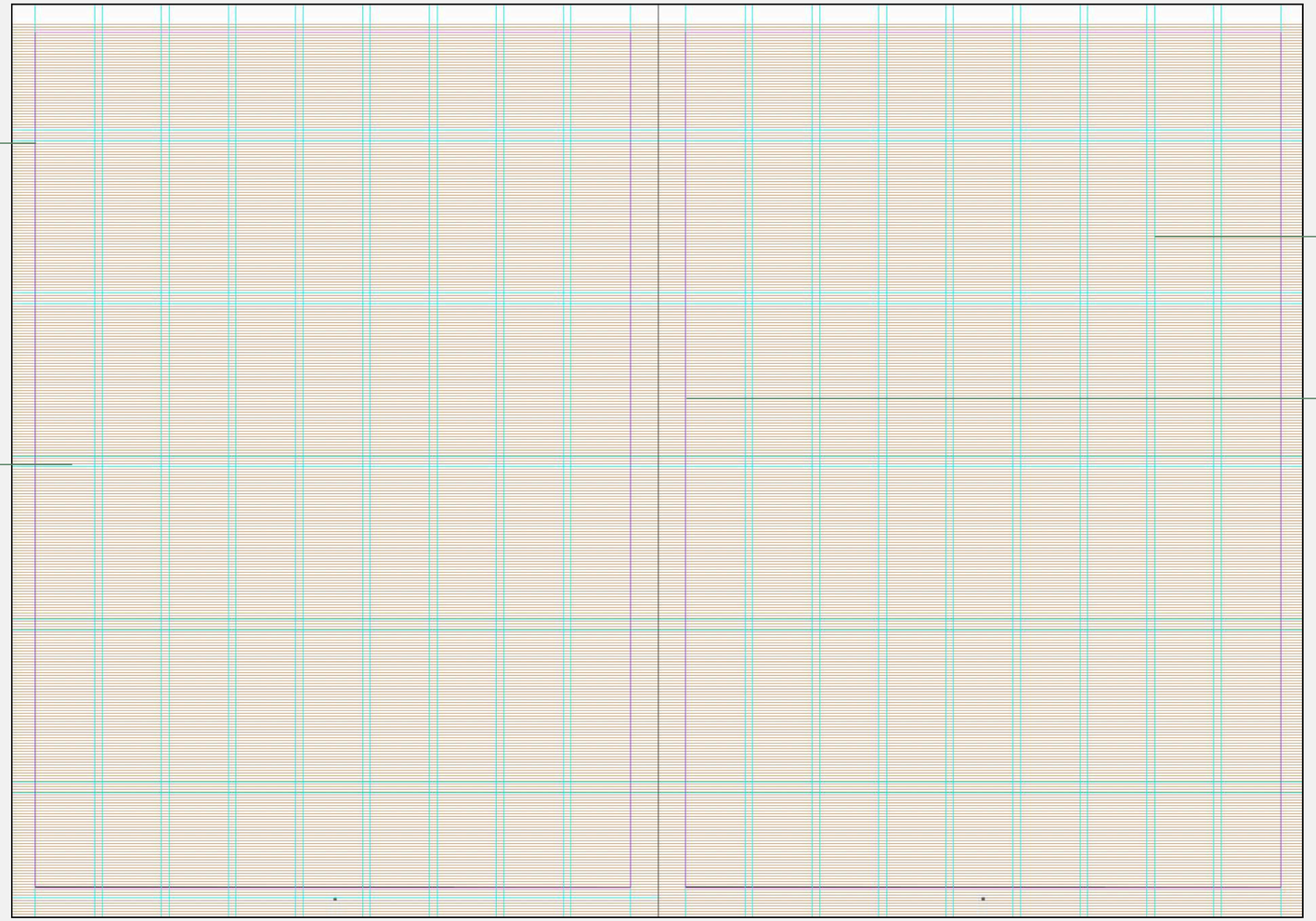
C: 93%
M: 58%
Y: 100%
K: 0%

Hex: #537E5F

C: 1%
M: 95%
Y: 86%
K: 0%

Hex: #DF1D23

Grid System



Top Margin
18mm

Outside margin
15 mm

Vertical Gutter
5mm

Inside margin
18mm

Horizontal Gutter
7mm

Bottom Margin
20mm

Format: A2
Rows: 6
Columns: 9
Baseline: 5pt

Spread Analysis

Chapter heading
Archivo
Medium
36

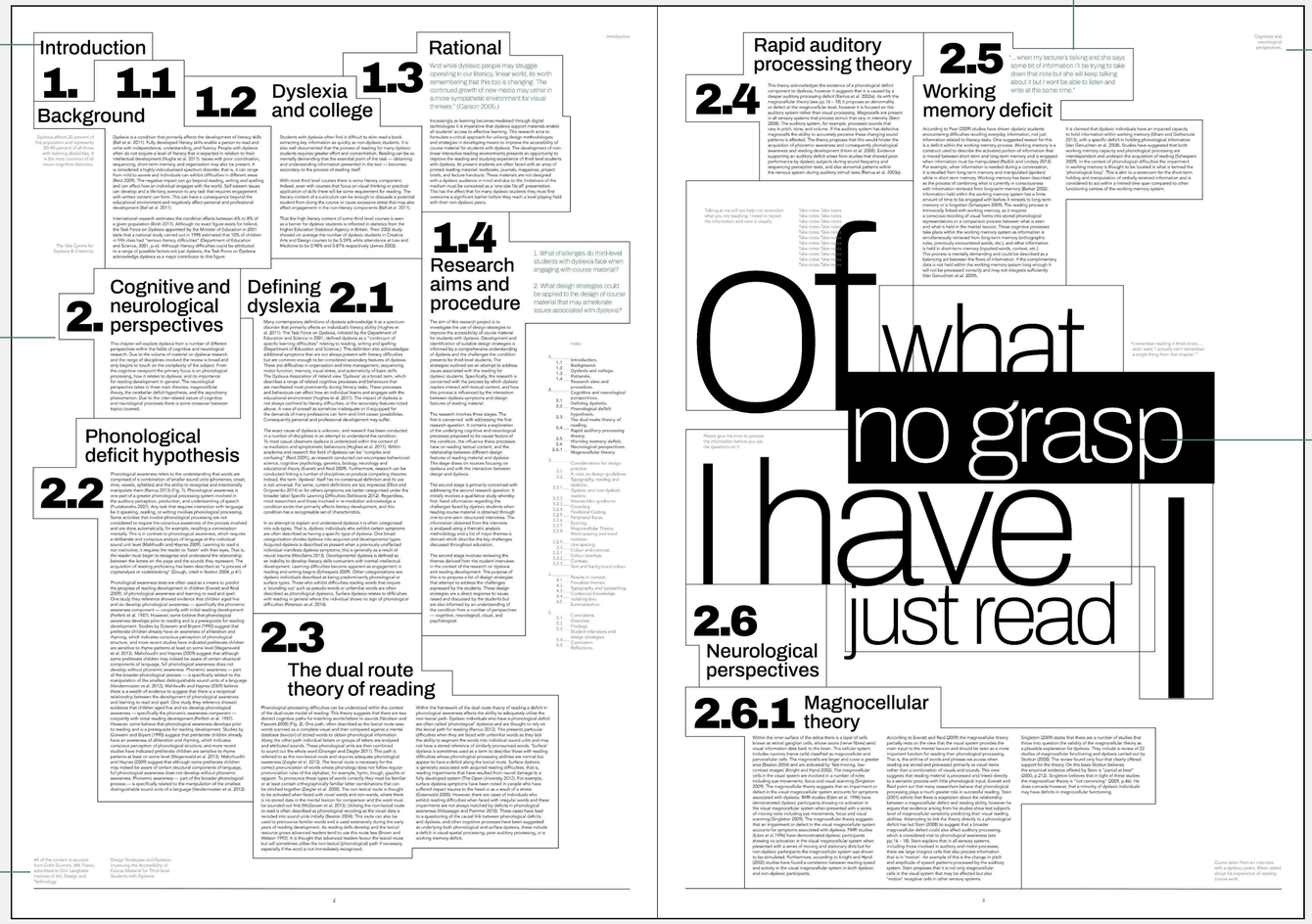
Chapter number
Archivo
Black
80 pt

Caption
Avenir
Book
8 pt

Quotes
Avenir
Light
12 pt

Chapter title
Avenir
Book
8 pt

Expressive quote
Archivo
Thin
Mixed sizes



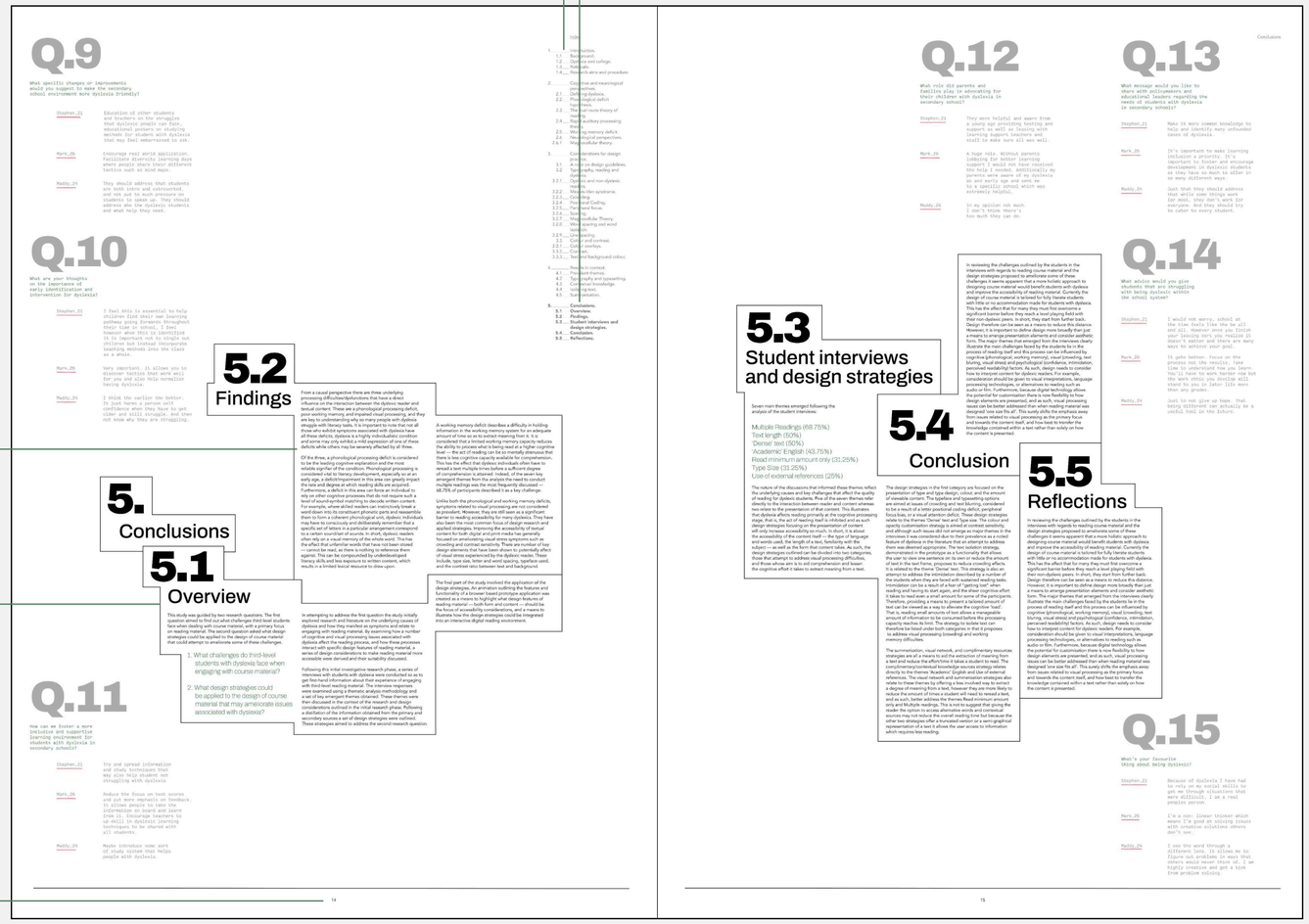
Continuous text

This opening spread intentionally deviates from the book's grid system, creating a sense of controlled chaos to overwhelm the reader. Despite the unconventional layout, the text blocks remain anchored within lines, allowing for independent reading within each section. Setting the tone of the unconventional thinking of people with dyslexia.

Spread Analysis

Index
Avenir
Book
10 pt

Index highlighted
Avenir
Black
10 pt



Reading text
Avenir
Book
8 pt

Text block boarder
5mm

Page number
Avenir
Book
8 pt

The index

To help the reader make their way through the large amount of content I made sure to include an index on each spread. The Index weight would increase to indicate the section of the book the reader was on.

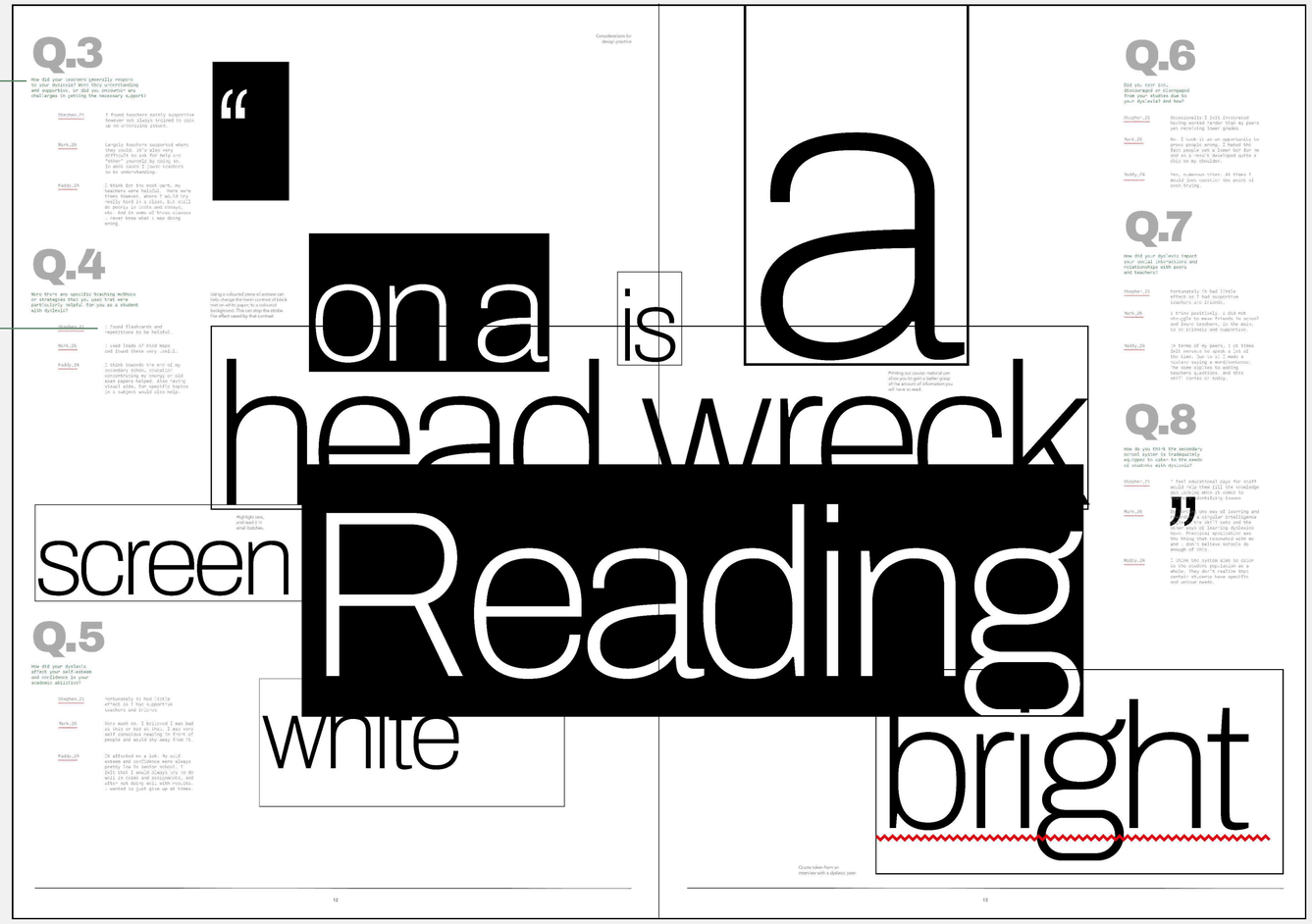
Spread Analysis

Interview Q
Avenir
Book
8 pt

C: 93%
M: 58%
Y: 100%
K: 0%

Interview A
Avenir
Book
8 pt

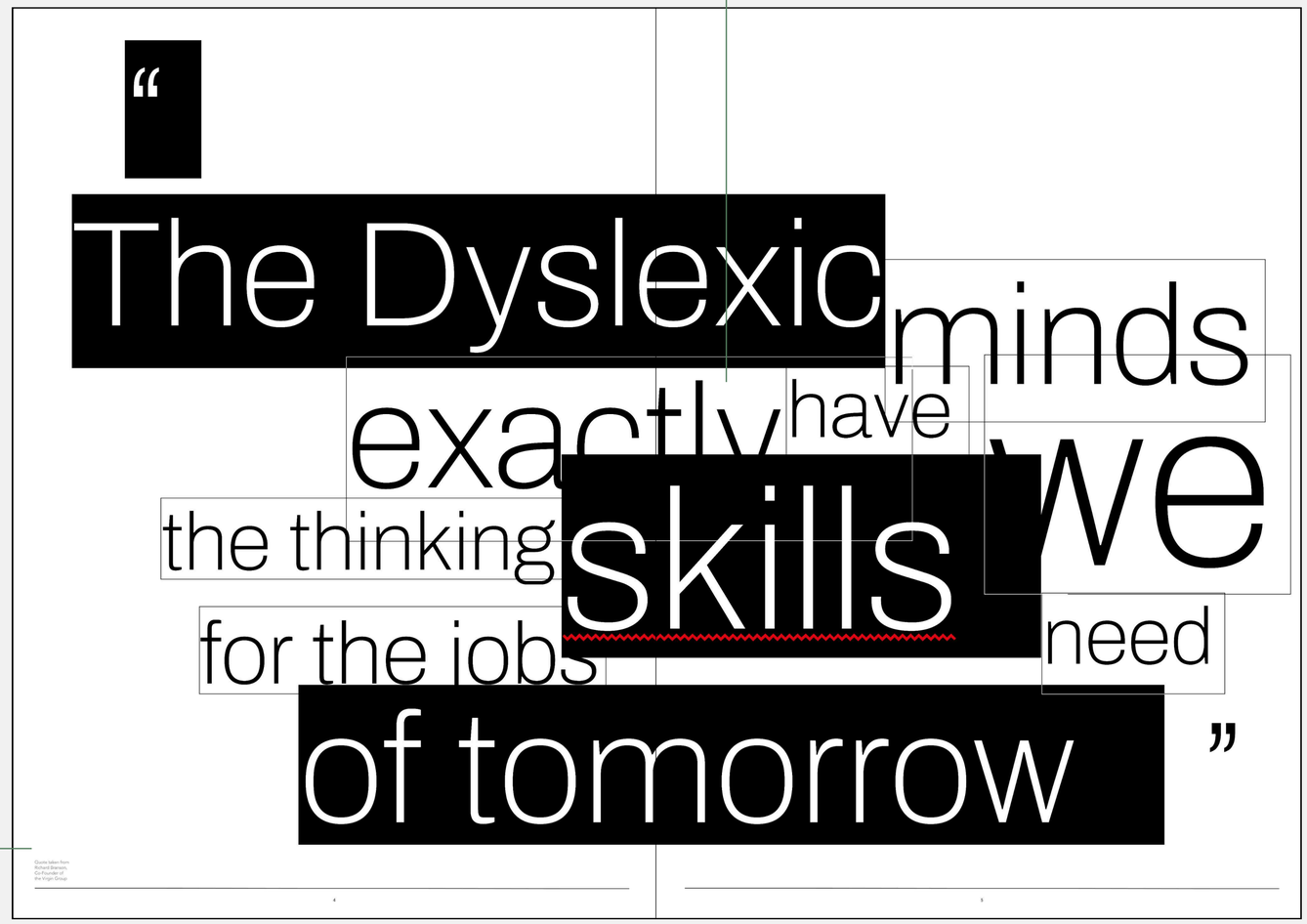
C: 0%
M: 0%
Y: 0%
K: 66%



Interview
Weaving throughout the publication are personal experiences from individuals with dyslexia, shared through semi-structured interviews. Presented in a subtle grey, these stories appear outside the main text boxes, inviting readers to discover them at their own pace.

Spread Analysis

Expressive quote
Archivo
Thin
Mixed sizes



Caption
Avenir
Book
8 pt

C:	0%
M:	0%
Y:	0%
K:	66%

Expressive quotes

Taking quotes from people with dyslexia, arranging them in a way in which the reader needs to de-code to reveal the statement. Using different size text to highlight certain words. The use if the spelling error underline is used throughout the publication as a way of drawing the eye to different sections of the information.

Thank You