



How can VR technology help people gain a better understanding of dyslexia?

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Abstract:

This study critically examines research progress on dyslexia worldwide and psychological and technological interventions for people with dyslexia. It reflects on the limited studies on raising public awareness, going beyond research concerning people diagnosed with dyslexia or related to people with dyslexia, and the importance of how educating the public about dyslexia can prevent people with dyslexia having mental illness. The purpose of this study is to: (a) highlight the mental depression and anxiety people with dyslexia encounter caused by misunderstanding by the general public about dyslexia, (b) explore the impact and popularity of digital game-based learning in public, and (c) investigate virtual reality (VR) game play as an approach for mitigating the phenomena of lack of self-disclosure of dyslexia and overcoming misconceptions about people with dyslexia in the educational environment by motivating the public to learn about dyslexia through the popularity and influence of gaming culture and VR technology. A proof of concept design of VR games for educating people about dyslexia is presented according to examinations and research methods undertaken.

Introduction and Background:

Dyslexia is a life-long condition that is characterized by reading, spelling and writing learning challenges. It is neurobiologically caused by factors of genetic inheritance (Schumacher et al., 2007) in that there is a difference in patterns of left parietotemporal areas of the functional brain, which is in charge of comprehending written and spoken language, making pattern recognition processing more difficult compared to the majority of the population (Shaywitz et al., 2003), and accidental brain injuries (Coslett, 2000). The term *dyslexia* was initially taken from the Greek language, meaning "difficulty with the word", which was first defined by Rudolf Berlin in 1887. Further study of it in neurological, medical, and psychological fields was

developed and expanded in English-speaking countries. Behaviour checklists and formal diagnostic assessment tools identifying symptoms of individuals with risk of dyslexia have evolved with the development of research findings in the field. During recent decades, a strand of literature study has emerged that focuses on the conceptualisation of other neurological deficits and discusses uncertain hypothesis of visual attention span (VAS) performance which has been associated with poor attention-based interpretation in people with dyslexia (Vidyasagar and Pammer, 2010). The findings of this research has been leveraged for the purpose of dedicating the diagnostic assessments for precisely identifying dyslexia in varying degrees from mild to severe cases, as well as putting these theories into practice with multimedia technologies for interventions to improve reading and writing performance for people with dyslexia in different age groups.

Since the early findings about dyslexia were built on the aetiology of dyslexia discovered only in languages consisting of phonetic alphabets, in countries like China that use logogram language with unique characters, the existence of dyslexia had not been acknowledged until the late 20th century (Longxue, 2021). Experiments by Stevenson Harold and other researchers demonstrated cases of dyslexia in Chinese and Japanese students, proving orthography as the determining factor for dyslexia regardless of the difference in writing systems across cultures (Stevenson et al., 1982). Unfortunately, the difference in the progression of research on dyslexia across cultures and lack of concern in educating the public about dyslexia has caused ignorance and misunderstandings that frame public perceptions. The lack of awareness and misperceptions are psychologically traumatising for people with dyslexia. Research by the International Dyslexia Association has found that, anxiety and depression are "triggered by the demands of being with or interacting with people and is characterised by a strong fear of being judged by

others and of being embarrassed" (Anon, 2014). Dyslexia is predominantly diagnosed in teenagers during school age (Yao et al., 2022; Zeng, Ju and Hord, 2018), and negatively implicates overall academic performances. The development of psychological interventions for dyslexic student therefore becomes crucial for reducing mental distress and depression. Anxiety can be further reduced with the education of the public about dyslexia. This enables students with dyslexia to get effective support to enhance their learning process

The current approaches generally used by dyslexia specialized researchers, organizations, and labs and departments of governments for educating people about dyslexia leverage entertainment media: , websites, social media, documentaries, and live-action adaptation journals based on real life of people with dyslexia. Documentaries like *Mical*, and Malcolm Gladwell's book *David and Goliath*, use visual scenes and language that reflect on the cause of psychological afflictions that people with dyslexia constantly undergo regardless of age caused by misunderstandings from surroundings and academic environments. Throughout the film, the terms "lazy", "stupid", and "slow learner" have frequently appeared in comments and feedback about Mical, the protagonist with dyslexia, from teachers and classmates at school. In fact, the IQ achievement discrepancy and social contexts of people with dyslexia are no different than neurotypical readers. (Vellutino et al., 2004). Despite this fact, most people will only judge them through their poor academic performance and negate their strengths. The biased judgement leads Mical to become a disruptive, "defeated introverted child full of anger" (Nessy's Dyslexia Explained, 2021) who quickly gets frustrated against himself and hateful towards school, and even later experiences physical pain and discomfort. Similar manifestations appeared during case analysis of two people mentioned by Gladwell in his work. The experiences of Mical are based on a true story and demonstrate how misconceptions can gradually become "facts" and define

public perception. Consequentially, this deepens the psychological burden for people with dyslexia. Furthermore, it has prevented people with dyslexia from self-identifying themselves and seeking academic support from the institution until they encounter the risk of academic failure. It is therefore essential to investigate more constructive approaches for arousing public awareness of the existence dyslexia to help reduce the manifestation of mental health issues, including, lack of confidence and poor self-esteem, in those diagnosed with the condition..

The investigation of educational strategies for amplifying students' motivation and engagement in learning with multimedia technologies has achieved great success with the emergence of the DGBL (Digital Game-Based Learning). Its advantage is breaking down complex subject information into smaller concepts and combining the learning process with goals that fulfil a sense of accomplishment and strengthen the feeling of progression in a short amount of time, (Zin, 2009) and encourages active motivation and passion, resulting in a noticeable boost in academic performance. VR technologies artificially simulate a real-world environment and situation that users can immerse in and interact with. VR technology has been developed as clinical and psycho-cognitive approaches to help people with dyslexia as immersive experiences in 3D-interactive virtual environments with avatar technology representing users (Maskati et al., 2021). While the psychological and educational study of dyslexia has focused on interventions in learning processes of those with dyslexia,, there is lack of study on educating the public about dyslexia using DGBL and VR technology. This study will address that gap and investigate how to increase understanding and challenge misperceptions about dyslexia using VR.

Methods:

The overall approach for this study has included both quantitatively and qualitative methods. A questionnaire was selected to examine what degree of knowledge and perceptions people hold, whether there are any common misconceptions the public has about dyslexia, and the factors that motivate participants to learn about dyslexia. (see Appendix A). It applied both open questions and multiple choice for gathering systematic data to analyse possible factors influencing participants to know about dyslexia and encouraging participants to present their views without constraint, enabling us to perceive this study through a different lens. The questionnaire was posted on social media, and through social groups, to recruit volunteer respondents. The questions were designed to give options in order to avoid any ethical discomfort and encourage people with dyslexia to participate in the questionnaire.

The screenshot shows a Google Forms interface for a survey titled "Survey About Public Understanding of Dyslexia". The form is currently in the "Questions" tab, with 32 responses recorded. The survey content includes a welcome message, a link to a participant information sheet, and a multiple-choice question: "I have read the information sheet about this project". The question has two options: "Yes" and "No". The "Yes" option is currently selected.

Survey about Dyslexia

Questions Responses 32 Settings

Section 1 of 6

Survey About Public Understanding of Dyslexia

Thank you for your interest in helping us with this research. This survey is to examine the general public's understanding of dyslexia.

Please read the following participant information sheet carefully before starting the survey.

https://drive.google.com/file/d/1u5B7uRzP3oyjh20aeEpn_YNoxd0_lrr7/view?usp=sharing

I have read the information sheet about this project

Multiple choice

Yes

No

The research has also included the semi-structured interview method. Online interviews were carried out and recorded through Zoom. (see Appendix B) in the aim to get experts' professional views based on their experience in related research they have done previously with dyslexic students. The interviews helped me reflect on the findings obtained from the literature search. The interview template was designed to lead the conversation their experience dealing with people who potentially have dyslexia, the reasons that prompt people to seek for diagnosis of dyslexia or avoid it, and why dyslexia is still relatively poorly understood by the public despite that it was identified a century ago. Additionally, the questions inquired how to arouse public awareness about dyslexia. Insights from both the questionnaires and interviews informed the design the features of a VR game that is an outcome of this study.

Results and Discussion:

Data was collected through questionnaires from 32 participants with diverse backgrounds of cultures and acquired languages and interviews with three experts in terms of professionally studied dyslexia.

The result of the questionnaires turns into the diagrams and charts below:

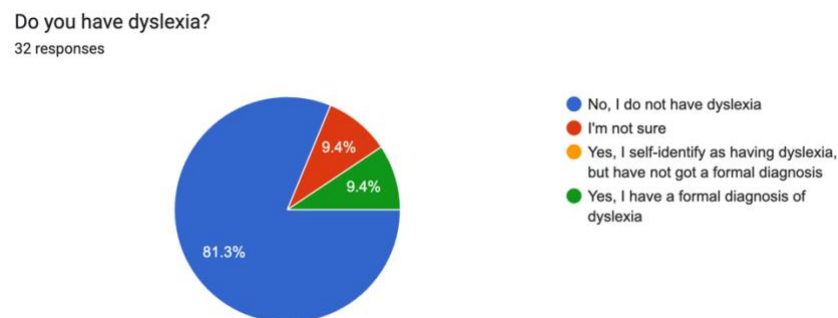


Figure 1: This diagram identifies the percentage of participants who either self-identified as having dyslexia, were formally diagnosed with dyslexia who do not have dyslexia or who are unsure if they have dyslexia or not.

Have you heard of the educational psychological test/Diagnostic Assessment for Dyslexia?
32 responses

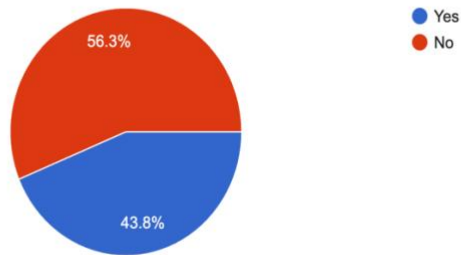


Figure 2: This diagram shows the percentage of participants who have heard of the diagnostic assessment, which is essential in the educational system for identifying dyslexia.

Have you ever taken the Diagnostic Assessment for Dyslexia test?
14 responses

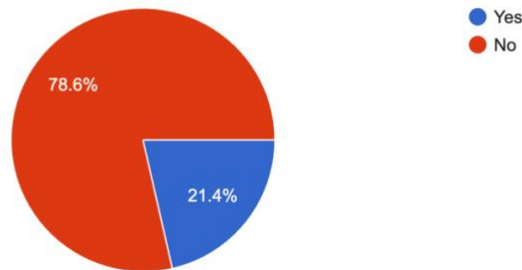


Figure 3: This diagram portrays the group of participants who have heard of the diagnostic assessment test for dyslexia and the percentage who have taken the assessment.

If you have a dyslexia diagnosis, what age were you when you were diagnosed?

14 responses

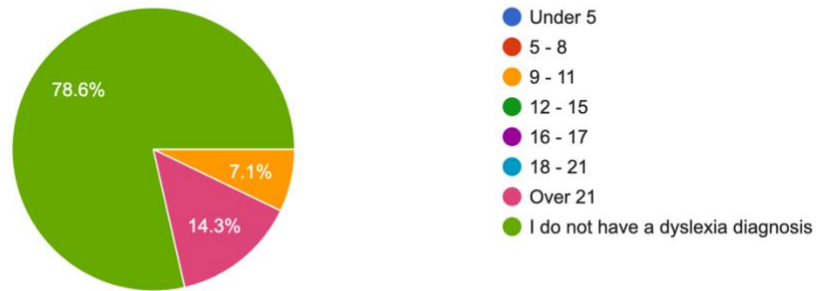


Figure 4: This diagram shows the group of participants whose percentage in different age groups took the diagnostic assessment to identify whether they have dyslexia.

How many people do you know who are dyslexic? If you are dyslexic, do not count yourself.

32 responses

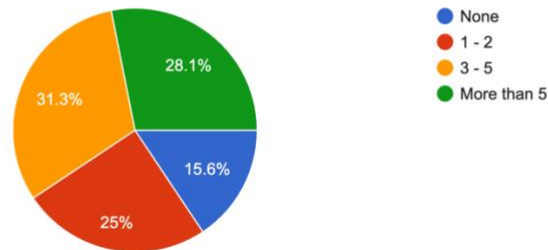


Figure 5: This diagram describes the percentages of participants, and whether they know people who have dyslexia.

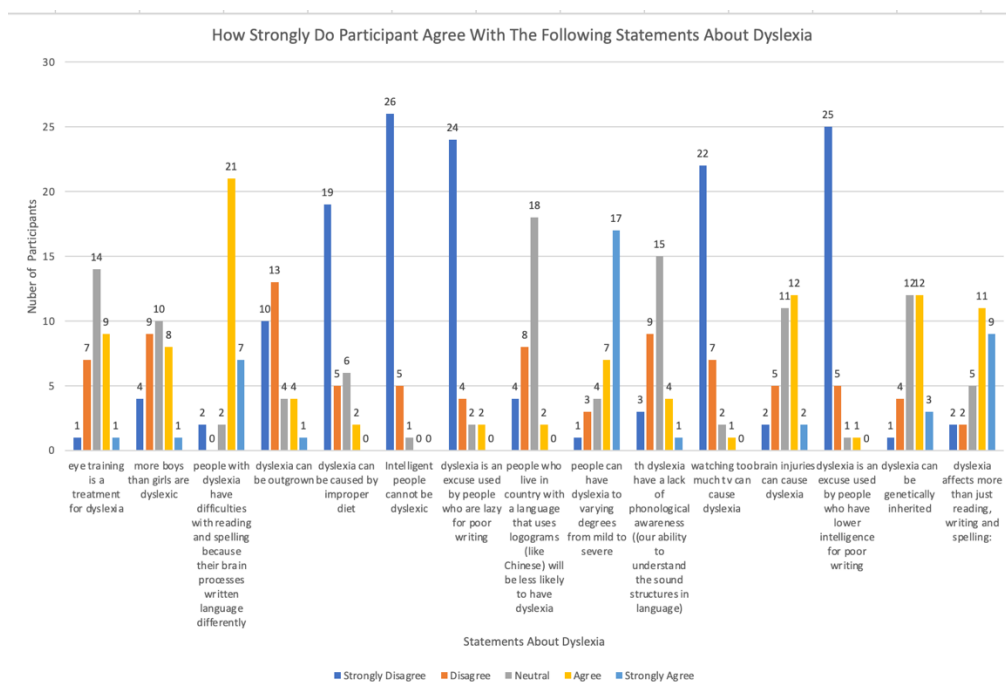


Figure 6: This chart presents responses to statements about dyslexia which reflect participants level of knowledge and misconceptions.

The questionnaire data collection reveals that 81.3% of participants do not have dyslexia, 9.4% of participants identified as dyslexic and 9.4% were unsure. Despite the majority not having dyslexia, 84.4% of participants know people who have dyslexia. However, less than half know about diagnostic assessments for dyslexia. Of those who know about diagnostic assessment but have not themselves been assessed, only a couple have had family members assessed or are aware of the tool through other parents of children with dyslexia. More participants who had diagnostic assessment were assessed over the age of 21, One of the participants who sought an assessment from British Dyslexia Association themselves, and the rest were referred through their university support services. .

According to Figure 6, overall, most participants reveal a profound understanding of dyslexia, which is inferred to be due to the fact that many of them have learned about dyslexia through dyslexic person they know. Their responses to statements about dyslexia show that they

do not share a majority of common misconceptions and for the most part, have correct knowledge. Nevertheless, the following six statements received responses that demonstrate uncertainty in perceptions

- **Eye training is a treatment for dyslexia:**

False: Visual attention training is effective for helping dyslexic people improve reading, but cannot cure dyslexia.

- **More boys than girls have dyslexia:**

False: Early research identified more cases in males than females, but there are not enough statistics to support that gender influences mechanism and processes for language processing.

- **People who live in a country with a language that uses logograms (like Chinese), will be less likely to have dyslexia:**

False: The study of dyslexia started earlier in Western countries, however, research conducted worldwide in recent decades, demonstrates the existence of dyslexia regardless of the languages or writing system.

- **Brain injuries can cause dyslexia:**

True: Neurological studies of dyslexia have categorized dyslexia as acquired dyslexia and developmental dyslexia. Acquired dyslexia is caused by brain injuries, such as a brain tumour, . can lead to difficulties in reading comprehension and speaking ability.

- **Dyslexia can be genetically inherited:**

True: Developmental dyslexia is understood to be a genetic condition that can be passed to children.

- **Dyslexia affects more than just reading, writing, and spelling:**

True: Researchers have conducted investigations on the influence of dyslexia to overall academic performance. So far it has been confirmed that dyslexia impacts memory, timekeeping, organisation, concentration, ability to multi-task and communication.

The aggregate data collected from the questionnaire shows that the presence of the diagnostic assessment tool to identify dyslexia for getting support like Individual Education Program in the US or Disabled Students' Allowance in the UK, does not have extensive awareness. Based on responses to open questions, people in an educational environment, or with family members who have dyslexia, are more likely to be informed of existence of dyslexia and diagnostic assessment. The limitation from this data is a lack of diversity in participants from backgrounds other than higher education and those speaking phonogram languages as a native language, despite the fact that participants come from many cultures. It is also noteworthy that there are fewer cases of participants learning about dyslexia outside of knowing dyslexics or being diagnosed. Therefore, the level of knowledge and misconceptions that participants possess is not reliable to represent the real average level of understanding that the public has regarding dyslexia, but it still provides a good foundation for the design of VR games.

In interviews with experts in the study of dyslexia, expert i) (see Appendix C), suggested that the high cost of diagnostic assessment obstructs students to get a formal assessment of either identifying or not having dyslexia, but since teachers in the UK now have increased training about dyslexia and related learning differences, students can still get supported if they are at risk

of having dyslexia. She also talks about a perception some adults have that dyslexia is only diagnosed in children and her findings of strength in creativity. She suggested to portray people with dyslexia of having both weakness and strength in the VR world. Situations of struggle as well as triumph should be included, ensuring to highlight that there are benefits for having dyslexia. Additionally, she comments that the gameplay can include a complex series of tasks, mirroring the situation of someone giving a list of instructions to a dyslexic person who typically would have trouble with remembering verbal and written directions and be challenged to memorize full instructions and accomplish multiple tasks consecutively.

The second interview, expert ii) (see Appendix D), also mentions the cost of getting diagnostic assessment as a barrier. Another barrier is how most people feel about the testing. She has learned that a lot of people suspect themselves of having dyslexia but are unwilling to do the test because of the possibility that they do not have dyslexia but have lower intelligence. She would appreciate to see elements known as people with dyslexia represented in the game.

The last expert iii) (see Appendix E), has tested as dyslexia through diagnostic assessment, and shares her experience of self-disclosure of dyslexia and people's perception that technologies like spelling correction software, can cure dyslexia. In fact, the difficulties with spelling for people with dyslexia persists because of neurodiverse phonological processing and memory functioning. She suggests that a VR game design needs to include representations of different degrees of dyslexia to demonstrate a complete impression of what dyslexia really is about, and to reinforce that is not limited to reading difficulties.

The constructive feedback and perspectives learned through the interviews in terms of game design includes including a board spectrum of the manifestation of dyslexia, including in language skills beyond phonology, as well as depicting the dyslexic characters with both their

struggles and their strengths is crucial. In addition, scenarios should be designed so that players gain a better understanding of dyslexia and its difficulties through simulated experiences of how it causes inconvenience and leads to frustration in day to day life. The interviews also revealed interesting perceptions that exist in inertial thinking of adults which were not examined in the literature search.. To improve upon the findings thus far, further research could be conducted with experts who study dyslexia in different cultures to explore misunderstandings more in-depth and uncover any that were found in the literature search and may be popular in other countries.

VR game design

Insight from the literature search, questionnaires and interviews inform current research progress on dyslexia and provide the foundation for the game design. The game, named *Deslyxia Mthy*, will be a first-person puzzle video game for players. Players will be given clues from dyslexic non-player characters (NPCs), through conversations, interactive activities, and intimate exploration of scenarios, to put together a storyline or find specific items requested by NPCs. The level of difficulty will increase as the player passes through more scenarios.

Scenarios Setting

The purpose of the game is to gain insight into dyslexia through entertainment. The scenarios design aims to demonstrate the challenges people with dyslexia face in different aspects of daily life. Therefore, scenarios will include a variety of situated spaces such as home, music studios or escape rooms. During each scenario, the player will role-play different kinds of relationships with the dyslexic NPCs based on a storyline. Players will learn what their final goals for passing a level are in conversation with NPCs from the beginning of the scenario. The goals will vary and could be as easy as going to a friend's house for requesting something the player needs to

find or as hard as detecting a full storyline of what this NPC has experienced with dyslexia through a progressive development of tasks for clues. As the player increases the game level, there is also an increase in complexity of the game. there will be more requested tasks of finding clues sequentially through exploration of players in the situated space, and interactivity with dyslexic NPCs to analyse clues and obtain hints for the next clues.

- Example Scenarios for Level 1

1.1. Player role-plays the barrister of the NP Cto get certain documents for a case from this client.

1.2. Player will be placed in the living room of the house of the NPC to start a conversation surrounding what the cover of the document looks like and where he/she has last seen it.

1.3. After gathering information, player starts to explore possible places the document is.

1.4. In the end of exploration, three similar covered documents are found and considering the privacy of client, player needs to return to the NPC in the living room and ask him/her to identify which is the requested one.

1.5. Player needs to wait for the NPC to read over these documents and identify the right one to complete the level. [the long waiting time is designed to shows player a typical symptom of dyslexia as slow reader].

* Player during waiting time has freedom to explore the room and discover the glasses with tinted lenses as a hidden item on table. When they pick up the glasses there will be short explanation about the theory of mitigating visual stress and benefit struggling readers with the glasses (Singleton, 2012), and if the player hands them to the NPC, the wait time will shorten.

Gameplay Setting

- Interactivity

The storyline in each scenario is driven by the player's interaction with dyslexic NPCs. The interaction is not limited to conversation; depending on the tasks, or the feedback from NPCs for more hints in solving the clue which they have gotten through exploration, players are given instructions, such as drawing a visualized pattern or using body language to communicate with dyslexic NPCs instead of text on paper to see the strengths of visualization and problem-solving abilities of people with dyslexia as well as learn of the challenges and symptoms of dyslexia in their life.

- Finding hidden items

The hidden items will not be as essential as the clues and requested item by tasks for the main thread of scenarios. These will help players solve clues easier while introducing players to the assistive tools found by researchers for supporting people with dyslexia, for example, the tinted lens glasses mentioned in the Example Scenario fasten the reading speed for dyslexic people characterize visual stress. Also, a Smart Pen will be a hidden item that if found by the player, can be used by a NPC to record a voice note to overcome the players difficulty with understanding a NPC with severe degree of dyslexia that writes with muddled spelling. This tool can save time and alleviate a NPC's stress from suffering through the process of reduction into correct one.

- Motivation / Reward System

The game's structure will be divided by levels of difficulties. When players pass a level, they will receive game points measured by the tasks completed in the main thread and hidden plot as well as with the discovery of hidden items. Different rankings will arouse competition between

players as a motivation for engaging in the game. The game points can be spent in the shop for getting items that might be helpful to getting clues in next scenarios. The shop will include rewards that can be useful in reality like a funded opportunity for getting a diagnostic assessment. This tool is valued for identifying strengths and weakness in learning process and can help improve anyone's efficiency in learning processes.

NPCs Setting

The appearance design of NPCs will give players insight into the existence of dyslexia across ages, genders, cultures and languages. Diversity will also be reflected in how dyslexia affects people. The level of difficulties of scenarios will be matched with severity levels of people with dyslexia... Also, throughout the scenarios, the psychological state and self-perception of these NPCs about their dyslexia will be presented during conversations and with body language. This would include people oblivious to their spelling mistakes or people open about talking about their dyslexia that struggle with understanding an article through silent reading but can understand it from listening to others read aloud. While players interact with NPCs with different types of dyslexia in each scenarios and as the scenarios develop, players gain an understanding that dyslexia can be a pathway for people to achieve success through unique gifts of strength.

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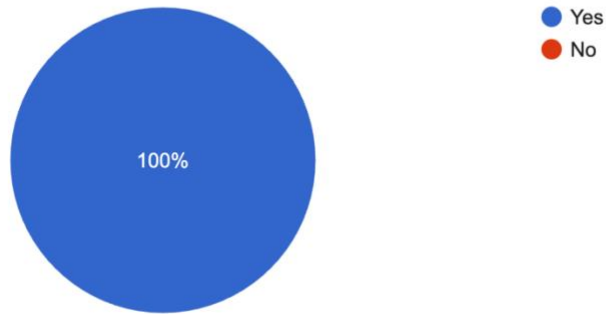
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Appendix A: Survey About Public Understanding of Dyslexia

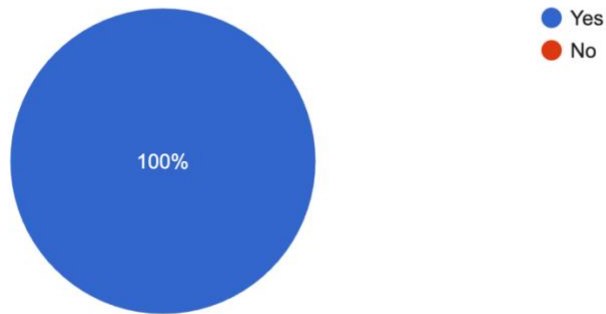
I have read the information sheet about this project

32 responses



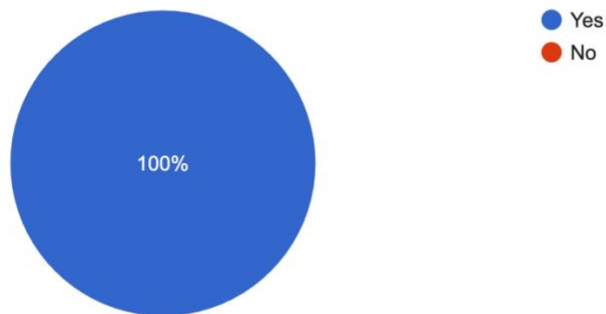
I agree to complete this online survey

32 responses



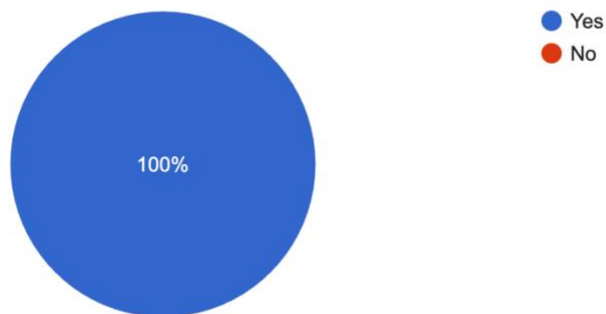
I understand my right to withdraw and/or have my data destroyed from this project at any time

32 responses



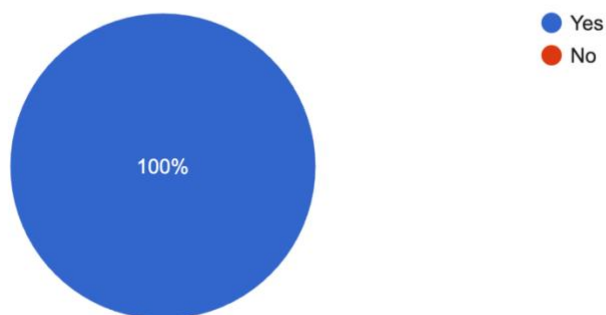
I understand that my participation in this project will be treated anonymously

32 responses



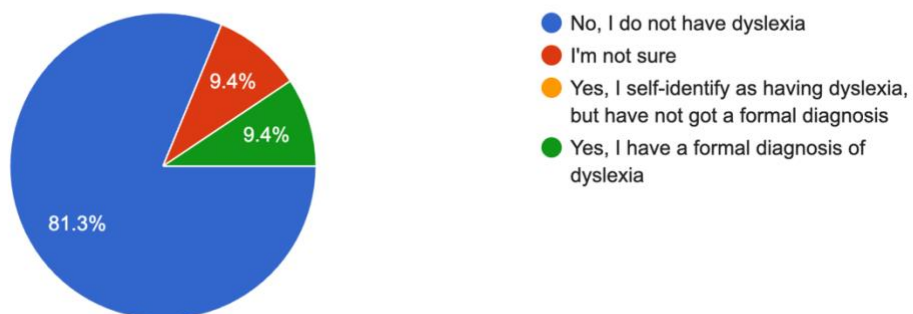
I am over the age of 18

32 responses



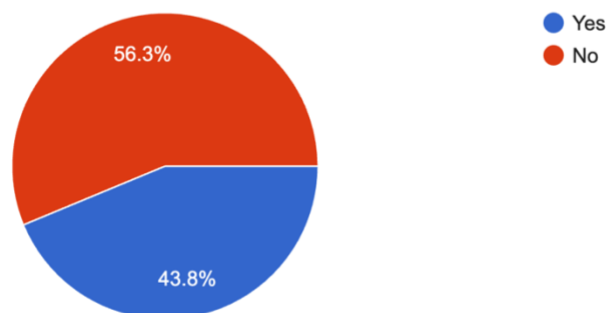
Do you have dyslexia?

32 responses



Have you heard of the educational psychological test/Diagnostic Assessment for Dyslexia?

32 responses



How did you learn about this the Diagnostic Assessment for Dyslexia test? 14 responses

I have taken this test.

Local school

It was something I was aware of from school right through to university.

A family member was assessed

My sister was assessed using it at some point in the past.

A family member took a test.

My daughter was assessed about twenty years ago

Aware from others who are parents

My son did it at school

I potentially have dyscalculia and whilst conducting research on how to obtain a diagnosis I also came across the dyslexia diagnosis test via the British Dyslexia Association

My university set this up

I Don't know

In class

Not sure

What do you know about the Diagnostic Assessment for Dyslexia test? 14 responses

Established, formal test for learning disabilities including dyslexia and is carried out by a qualified psychologist.

It is often carried out in schools

My personal experience of dyslexia means I have trouble spelling and doing maths. In addition I often confuse words that look the same, as a simple example Their and there.

Not a lot

That it is a standardised test which assesses if people meet the criteria for having dyslexia against a certain set of values and indicators.

Not a lot! A family member took a test that seemed vaguely similar to an IQ test.

That it exists

Usually carried out by educational psychologist

Not much

That the test generates an individualised cognitive profile to identify if a person shows characteristics associated with Dyslexia. Usually conducted by a registered psychologist. I was tested using it it was lengthy

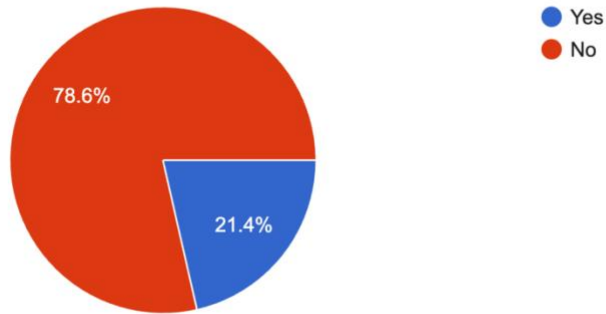
Nothing

Yes

I've only heard of this test, but I don't quite know what is it.

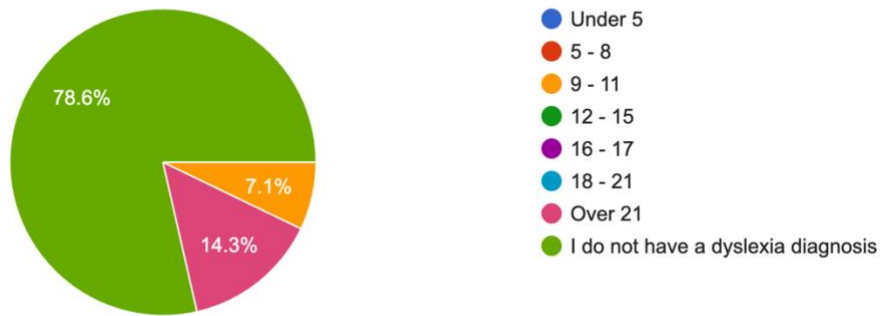
Have you ever taken the Diagnostic Assessment for Dyslexia test?

14 responses



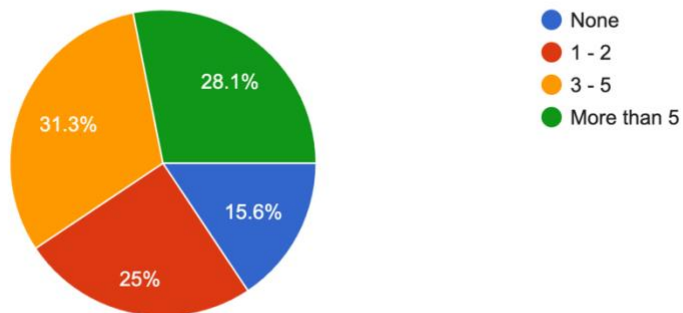
If you have a dyslexia diagnosis, what age were you when you were diagnosed?

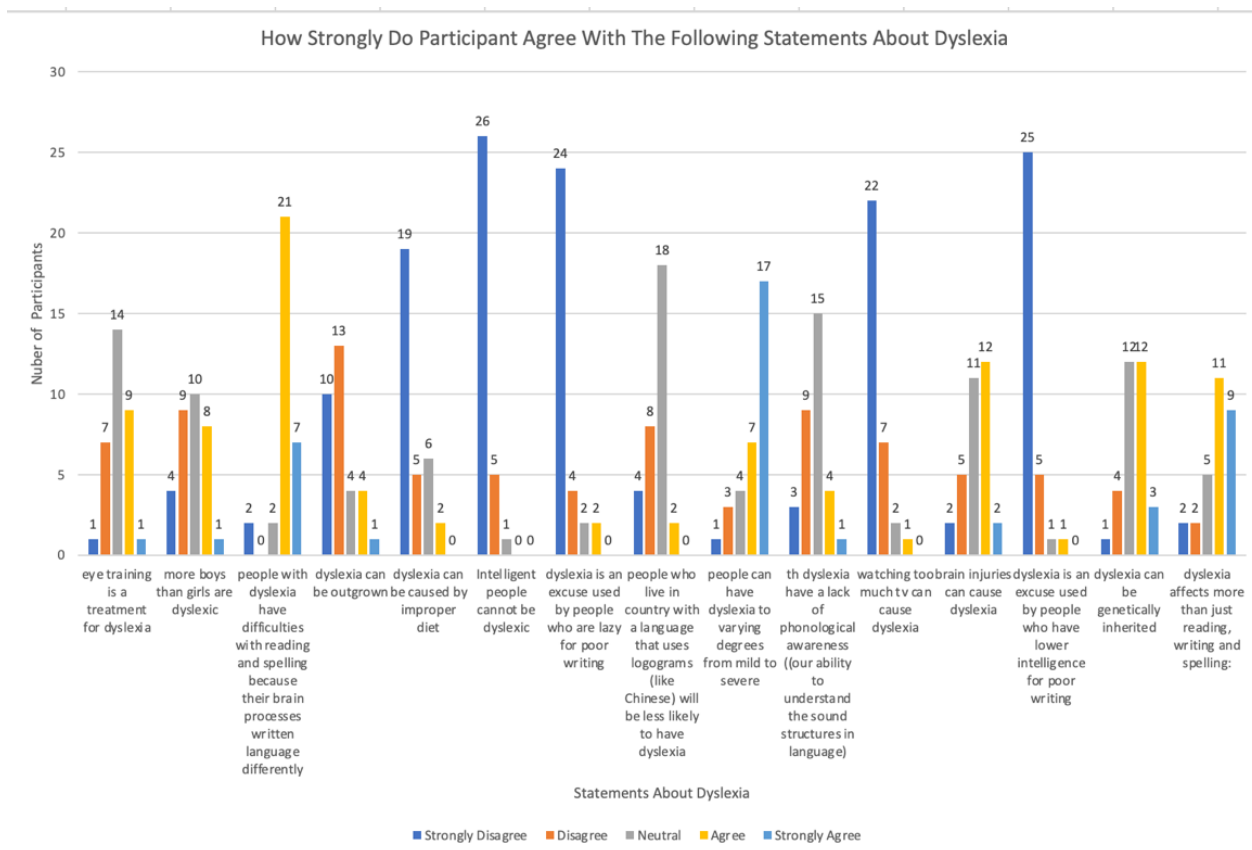
14 responses



How many people do you know who are dyslexic? If you are dyslexic, do not count yourself.

32 responses





If you would like to expand or clarify any of your answers above (e.g. through providing more detail or explanation) please do so here: 3 responses

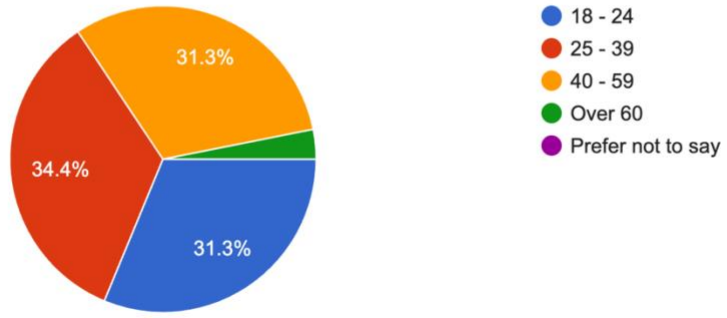
I'm not sure if all people with dyslexia have phonological difficulties or whether this is a differential characteristic dependent upon the extremity of dyslexia diagnosed.

I have dyslexia and so does my son. Our learning style is so alike. With dyslexia I struggle to take in and retain information. I have to revisit information making systematic notes. I also struggle with organising. I have a degree and currently doing a MSC and may others within either my undergraduate or post grad have dyslexia, therefore any intelligence can have dyslexia.

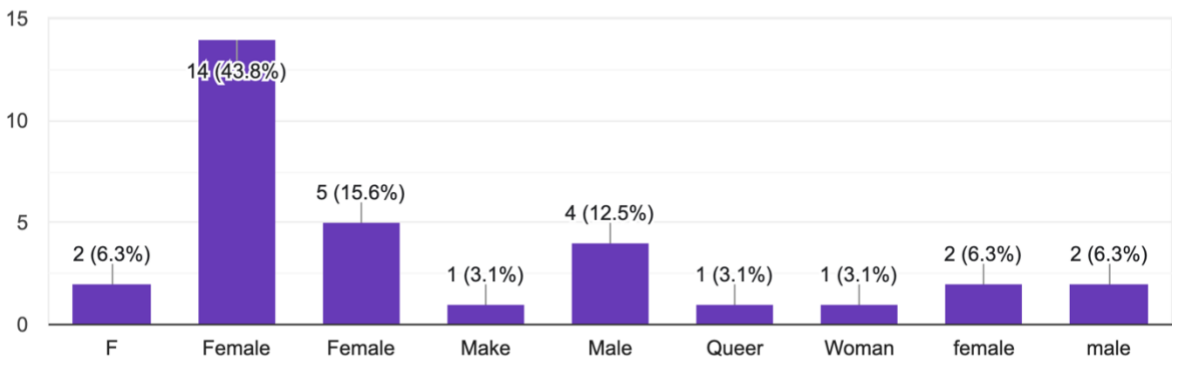
Based on my knowledge, I have made some educated guesses to complete the survey. Statements I have answered neutral are ones I am unsure of, and unable to make an educated guess.

Demographic Questions:

How old are you?
32 responses



What is your gender?
32 responses



Appendix B: Interview Questions

Let us start! This first section of questions are about how you learned about dyslexia.

To start off with, what does the term dyslexia mean to you?

How did you first learn about dyslexia?

What made you interested in learning about dyslexia?

What experience do you have either professionally or personally with people with dyslexia?

In your experience, when do you think most people are diagnosed with dyslexia? And what prompts them to seek a diagnosis?

Do you have any experience or knowledge about specific dyslexia diagnostic approaches? If so, do you find people who are motivated or unwilling to do this test to confirm that they have dyslexia?

Have you got any experience with people who might be avoiding getting a dyslexia diagnosis? If so, what were their reasons for avoiding diagnosis?

Dyslexia was discovered many years ago, but it is still relatively poorly understood by the general public. Do you agree with that? If so, why do you think that might be?

Have you ever come across misconceptions and misunderstandings about dyslexia? If so, what sorts of things do people think that are incorrect?

How would you describe dyslexia to people who have bias against it?

What do you think is the most effective way to raise public awareness about dyslexia?

As you know, I want to design a game or VR experience to help the public to better understand dyslexia.

What do you think of this as an idea?

What sorts of things would you suggest that we can include in the game?

Appendix C: Interview Transcript with Expert I

I: Let's start the first section of questions, these are about how you learn about this, like to start off with what does the term dyslexia mean to you.

Expert I: My understanding of dyslexia has changed a lot over the years, I think I used to understand dyslexia as a learning disability, but that's very much not the case, because individuals' dyslexic people do not have general learning impairments, so people with dyslexia are often very good at many different things, but dyslexia and pass them on a couple of different tasks So for me dyslexia means someone who has a very what I would kind of call like a spiky profile, so they will be very good at some things and then pour others, just like the rest of us are so dyslexia is just to kind of another way of describing individual differences but with more profound deficits in certain areas, compared to the general population, I think that's how I would explain it.

I: it's quite interesting because, like during my research about this like see I felt found the same way and same feeling you and how did you first learn about dyslexia.

Expert I: Well, I threw my university degrees, I did an undergraduate degree in psychology. Then a master's degree in developmental disorders and clinical practice that's really where I learned about dyslexia, the most and i'm doing a PhD in autism

and i'm working alongside colleagues who do a lot of work with dyslexic children so yeah them through through university experience and through just working with colleagues who are really passionate about.

Expert I: helping children with dyslexia yeah.

I: So what made you interesting interested in learning about dyslexia like.

Expert I: yeah I think just the well, I think, firstly, I wanted to go into sort of clinical practice, and that was kind of what started it off, but the more that I learned about dyslexia, the more I realized that. There are a lot of misrepresentations in the media about dyslexia, and how children with dyslexia might be portrayed as intellectually disabled or weak academically and, but I think there's that that's just not the case and there's a lot of opportunity for us as researchers to step in and tell the true story of dyslexia, and to hopefully help some children as we go.

I: Interesting so, can you as you mentioned about your experience like it was the working with dyslexia children, could you give me some like detail about this experience either professionally or personally with people with dyslexia.

Expert I: So my experience with dyslexia is mostly through research and primarily at the moment, my research is all online because of the pandemic. So that's how it's you know that's had its ups and downs we've been the downside is we haven't been able to sit down. Personally, and speak with dyslexic children or their families, but the upside is that I've been able to be involved in some really big large scale studies, with hundreds and hundreds of parents during the pandemic and speak to them about what it was like to help home-school children with developmental disorders and things like dyslexia, and what the experience of the pandemic really look like for families where children aren't neurotypical or you know, completely having no learning differences, if that makes sense, so it was it was really interesting so yeah the pandemic has been an interesting way to kind of research that.

I: In your experience when do you think most people are diagnosed with dyslexia, and what prompts them to seek a diagnosis.

Expert I: So, in the United Kingdom. I would have to look this up, more specifically, but in the United Kingdom, I would say that the thing that prompts most parents to seek a diagnosis, for their children is the teachers and teachers are getting more and more train. In spotting dyslexia or spotting any developmental disorder disability or learning impairment very, very early on, with dyslexia, there are a lot of very early cues very, very early obvious things that can kind of sign to really shine out to a teacher, specifically, who is kind of you know, watching that child learn to read and write. That will kind of go whoa that's you know that's different that's that's something that we should maybe have assessed and so i'd say that most people most people are diagnosed quite young and I think that teachers are the reason for that.

I: yeah it's a really good news to hear because myself also personally diagnosis dyslexia, and by the time like my teacher don't really got the train about like spotting dyslexia, and I mean go through a lot of like mental and the physical struggle.

Expert I: yeah yeah it's really tough. You know generations and generations of people who were taught that things like dyslexia don't exist and that you're just you're being slow or you're not doing the work properly you're not paying attention but thankfully, now the training is catching up with what we know to be true, which is that these children are not intellectually slow or anything like that, but they they just need a little bit extra support or.

Expert I: Maybe not even extra support, but just help yeah.

I: And do you have any experience or knowledge about specific this dyslexia diagnostic approaches If so, do you find people who are motivated or unwilling to do this test to confirm that they have dyslexia.

Expert I: yeah I'm not personally familiar with the tests that are involved in dyslexia, and I know that Like anything at the moment there's probably a very long waiting list in the UK to get a diagnosis and my I mean my real speciality is autism, and I know that parents wait years and years for an autism diagnosis, because there just aren't the funds. To pay for the services that would do those diagnostic assessment and in the UK, I do have something up here, let me just have a look at it, because in the UK i'm trying to remember how they are actually diagnosed. so you'd have to be either a psychologist to kind of specifies in things like dyslexia, or it would have to be a specialist teacher so, for example, a special magical special educational needs coordinator. So there's one, at most, schools, but they have to be paid for, and those are very expensive and a child would need a sort of a formal diagnostic assessment, which requires a lot of different tests it's not like diagnosing say Asthma it's a lot it's very complex because dyslexia as a diagnosis we have to be able to say, but it is dyslexia, and it isn't say, for example, a developmental language disorder or a global learning delay. And those things can sometimes look very similar, so we have to do a lot of very specific tests to make sure that it really is dyslexia throat so, for example phonological awareness tests and recall memory tests and tests of reading vocabulary things like that so there's a lot but it's quite a it's quite an intensive process to diagnosis sexier.

I: So, have you got any experience with people who might be avoiding getting a dyslexia diagnosis, so what was their reason for avoiding the diagnosis.

Expert I: that's an interesting question I don't think I've ever come across anyone who wouldn't want that I think i've certainly spoken to people casually who have kind of portrayed all of the traits of having dyslexia and they're very well aware that they there, for example, they're reading ability or their writing ability just doesn't match up to other people have their age or career type or educational background and oftentimes what i've found isn't that people are going, oh no I don't want to get tested

for dyslexia. it's that they might not know what dyslexia is or if they are adults, they might think, oh no that's something that kids get that's not something that affects grown ups, but of course it is it's lifelong. So I guess lack of awareness, rather than reluctance if that makes sense.

I: yeah it's quite cool because a combined with my personal experience actually before I was in China, I didn't really like have any knowledge about dyslexia you I don't know what that term exceeded and then I went to Canada for study and it just suddenly this dyslexia, just like the knowledge about they come to me and I went to the do the test and diagnosis yeah. Just I still find it like a really interesting about. So my next question it's a little bit related to that it's about so dyslexia was discovered, many years ago, but it's still relatively poorly understood by the general public, do you agree with that, if so, why do you think that might be.

Expert I: Definitely, I think that the general public are starting to understand it, but there is still this kind of perception that it's something that kids have you know adults don't get dyslexia adults don't have dyslexia, but of course they do and as to as to why that is. If we look at the autism research a lot of when we look back through autism research and its history, a lot of it has been just terrible just really awful so for a long time researchers were absolutely convinced that autism was a form of schizophrenia. And then that only boys could get to get free only boys could get autism and that mothers were causing autism, and when those when those things come through the research pipeline. They run mean in the public psyche for such a long time, so there are probably many, many incorrect things that have come out of the research about dyslexia.

I: That remain in the public psyche for a long time, for example, you know autism, I mean the dyslexia, something that kids get dyslexia, is something that boys haven't girls don't and dyslexia means that you sees your you see the letters back to front, sometimes and that's it that's that's all dyslexia is you know, I think that people grasp on to what they can understand from the research and it takes a long time to move public opinion forwards.

I: So, have you ever come across misconceptions and misunderstandings about dyslexia, if so, what sorts of things do people think that are incorrect.

Expert I: Definitely, so I I was a teacher on a module at the education department at the University of York where we were talking about.

Expert I: We were talking about dyslexia, and it was really interesting to kind of break down what dyslexia is and talk about all of the strengths that dyslexic people have. In addition to some specific difficulties that they have and see some perceptions kind of changing slightly as the students realized dyslexia, to be to be completely blunt students were realizing that dyslexia doesn't mean stupid and it very much doesn't, but it was fascinating to have those conversations with them and talk to them about the ways that. Dyslexia presents itself and why those difficulties happen, you know

deficits in phonological awareness and verbal memory recall things like that. And for them to increase their understanding and go oh wow dyslexia is not as horrible as they thought it was to begin with, I suppose, does that make sense yeah.

I: totally understand about it because after I diagnosis with dyslexia, but now really get a deep knowledge about it, I was still like come up with like, am I really like stupid because of I get it and it's like sometimes it really stressful way to do academic with that type of sauce.

Expert I: it's absolutely not the case of that because you know there's so many things, yes, academia does rely a lot on some of the specific skills that people with dyslexia might find difficult, but there are so many things outside of that. You know raw creativity, the verbal language you speak able to speak very confidently and I think that that that often gets overlooked, because in in the UK at least a lot of times when we talk about children in the educational setting we go well let's have a look at their grades, and we, we put them down to that and that's really overly simplistic and that's not fair.

I: your son is a really interesting that people have this like sale will eventually like get into the Korea link with creativity is storytelling this type of.

I: Things yeah and also just by the way, I studying interactive media now it's also like. Giving this tree, so what I found it's like it's so funny I don't even know if it's like the there's any research confirmed that the dyslexia, people will like to get better in like creative side.

Expert I: I think if we if we did do the research, we find that dyslexic people have really incredible creative skills, like you said storytelling skills Problem Solving just these these things that you don't need the writing skills to be able to develop because they they come from a different place, and you know psychologically, they are very different, and absolutely I think if we did the research we've definitely find that yeah.

I: And so, how would you describe dyslexia to people who have bias against it.

Expert I: yeah i'm against it. I think I would say that dyslexia is just a term for a difference that a person has it's not a. I think I would say that it it's just a descriptor of differences that some children have to other children, like some children are. Right, you know, and not so they're really loud in class but they're not so great at math or something like that it's just another way of describing. The differences between one child and another and and just because a child or a person an adult I work, mostly with children, so child comes to my mind, most often just because a person is dyslexic doesn't mean that there is anything developmentally different about them, compared to any of any other people and just maybe they find some things harder than other people like, for example, my husband does not know his left from his rights, and that is just a difference about him compared to other people it doesn't mean that there's anything bad about that.

I: yeah Oh, you mentioned a really interesting point about like the children list dislikes there being like lousy or like. Like their performance in their classroom and that made me a came up with, like many research, I have done, they also just there's a really popular bias about like more boys have like it's more possible that boys have dyslexia then girls.

Expert I: The gender imbalance yeah it's a constant source of frustration I it's very annoying that. That for decades and decades and decades and centuries men have kind of been in charge of the research and they have done all the research so of course. What do they do, they look at men they look they only look at men and boys and they completely neglect women and they think that just because and women don't behave exactly the same as as men that well okay you can't be autistic or you can't have dyslexia or ADHD or anything like that. But the reality is often that women are more trained and conditioned by society to behave in a particular way and to present very quietly, don't you know, keep your head down don't speak up if you have a problem, whereas boys are kind of bouncing off the walls boys will be boys that kind of thing so it's much easier to spot those. boys who are who are exhibiting problem behaviors than it is girls, because we tell girls they've got to shut up and keep going. And it frustrates me it really it really frustrates.

I: yeah do you think, and now this situation is getting better like.

Expert I: yeah I I think I mean, at least in the autism Community i've seen a lot of research recently with the Community itself kind of going okay. What do you think we should be researching and the autism Community so children, adults family members Community practitioners that kind of thing are all coming back and saying we need more research on gender like we nobody seems to nobody seems to want to talk about autism and women. And I really hope that carries through, and I really hope that that gets seen in dyslexia and ADHD and all those different developmental differences. And so, what do you think it's the most effective way to raise public awareness about dyslexia.

Expert I: I wouldn't do and well, I think, firstly, I think, education in school and when I think about how I learned about things like dyslexia autism ADHD I learned about them primarily through school and that's a really good way to do it, I think, because it's a controlled environment where. Hopefully there's no misinformation there's no false hoods flying all over the place, you can kind of control the. Information that gets presented to younger people. And then maybe if you're lucky they'll go home and tell their parents and their parents might go out and have a conversation with their friends or something like that. So I think that's that's a really good place to start but, but secondly I think is is all media and films, TV books video games things like that I think they're all really important as ways to sort of integrate or kind of what do I mean ways to kind of get into the human psyche and then get people thinking about things and there's always a there's always a discussion now every time that there is sort of an autistic coded character in a film or in a TV show people are always having

conversation about it. About, did you see that it's not really interesting I didn't know that this

I think, maybe that's a really good way to start conversations.

I: yeah.

I: Actually I learned a lot of like interesting knowledge from the TV.

I: About like the disabilities that's it's rare to see in the room, like daily life, change the TV and I know there's still this type of group need help. I think it's really interesting also like about the you mentioned about like the school education can help like to raise public awareness about dyslexia, does the UK currently do anything on that, like work on anything.

Expert I: And as far as i'm aware, I don't I don't think so, and. They may do things now.

Expert I: I know that well, I know that in in the past sort of 10 20 years and diagnoses of learning differences and developmental disorders have increased, so perhaps those conversations are kind of happening, naturally, but as to whether they are part of the school curriculum i've no idea.

I: yeah that they only have that specialist like organization or school, just like for sending the children with dyslexia to and that just make it I feel is like excluded from the major to group and then from learning about like there's this like this people with learning disability exist, like, as well as like as a whole for like another barrier for dyslexic people to get over.

I: as you know, I wanted to design a game or vr experience to help public to better understand about dyslexia and that's mainly my research as well, so what do you think of this as an idea.

Expert I: I think it's a really interesting idea. I think I would be I would be cautious about only portraying dyslexia as weaknesses that are associated with it, I would be I would really want anything like that to kind of show the strengths. And the wonderful things about people with dyslexia, in addition to hey here are some of the things that we struggle with. But as long as like as long as that is kind of kept up I think it's a brilliant idea I think it's a really great way to educate people. And I think it could really stick in people's heads a little bit and make them have those conversations after they get home and go hey I bought this today, or I kind of did this experience today. And yeah I think it has really great potential as long as it's kind of highlighting how how awesome people can be if they have dyslexia, as well as the things that they might find difficult yeah.

I: So what sorts of things, would you suggest that we can include in the game.

Expert I: I think it would be interesting to speak to dyslexic people themselves about their experiences, or maybe you as a dyslexic person can kind of come from your own

experience, and I know that i'm dyslexic people have trouble sometimes with remembering verbal directions or written directions so someone gives you a list of instructions and you have to kind of memorize them and do something else, I know that that may sometimes be challenging for some people with dyslexia and.

Expert I: Maybe if the person playing the game has to kind of do these complex series of tasks and has to remember them they might get a feel for how frustrating, it can be to. To kind of go through life, sometimes as a person with dyslexia, and then maybe show. Okay well here's what a person with dyslexia can achieve if the correct support to put in place if they're given the tools that they need here's how incredible they can be the thing that everybody else can do.

I: yeah that gave me a lot of inspiration, I was like stuck in this stage of like during the creative process of designing the like outline of the game was always struggle with like is that being like two offensive to disappear, the first year, or like Oh, maybe like that, like even though i'm made it like the. People I still not understand well about dyslexia like a high too much about like what dyslexia can't do like what dyslexia, you know it just like much concern.

I: Thank you very much for taking time to talk with me.

Expert I: Tonight, and really.

I: Do you have any questions for me about my research.

Expert I: I mean, I guess, I i'd be really interested to see the final product, when it's when it's all done.

I: Thank you.

Expert I: yeah i'd love to like have a look at anything that you that comes out of there so i'd be really, really fascinated.

I: sure I should have asked some feedback from you.

Expert I: yeah i'd love to see it.

Appendix D: Interview Transcript with Expert II

I: Okay, so let's start the first section of questions, these are about how you learned about dyslexia to start off with what does the term dyslexia mean to you

Expert II: But a difference in brain structure and a difference in brain functioning that can create some difficulties with reading, sometimes, but it can also create other

learning difficulties like with attention and concentration and executive functioning and processing but it does tend to show up mainly in reading and i've been studying dyslexia, in the context of my own piano teaching, practice as part of my PhD research. And so you know i'm looking at the ways that it shows up with me with students who are learning music and it's very different so it's a spectrum condition. So it goes across the spectrum, so there are people who have very high cognitive abilities, who have dyslexia and people who have very low cognitive abilities and everything in between. So dyslexia is not necessarily correlated to a person's intelligence. It's just a different way of processing things and I think.

Expert II: It also can mean correlating strikes and so those are really important to build our teaching on those kind of strengths and things like that.

I: Well it's really interesting what you say about what's the difference in the performance of like studying music between the people with dyslexia, and the other people.

Expert II: There isn't a distinct profile it's very much an individual thing. But there have been some sort of like overarching themes were. You know a lot of dyslexic people do tend to struggle with a score with processing the score and and converting it into playing the music. But a lot of them have incredible oral strengths and memory strengths and the kind of overcome, I think the processing difficulty by by using those some.

I: cool experience, do you have either professionally or personally with people with dyslexia.

Expert II: So, as I said, I'm studying dyslexia, in the context of my PhD research and I'm also a member of the British dyslexia association music committee. And so I contribute to a lot of the British dyslexia associations handbooks and Article journals and things like that. and so I'll also consult with people you who reach out to the British dyslexia association and ask for help, or advice with students who are learning music, so I don't have I'm not a specialist teacher.

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Expert II: And I don't have that sort of specific dyslexia training as a teacher per se, but through my PhD research I've certainly you know gone sort of a deep dive into studying dyslexia, and the research.

I: Actually, I said the volunteer forms to the British dyslexia association recently how did you first learn about dyslexia.

Expert II: and I think I you know i've known about dyslexia for quite a long time and assumed that it was reversing letters, people who have difficulty with reading. You know I think there's a lot of jokes made about dyslexia and away with people don't really understand what it means. And then, when I was doing a master's in music

education, we had part of our course was studying dyslexia, and how it might affect music teaching and I became very interested in the topic because I had a student at the time, who I suspect is actually dyspraxia but with dyslexic tendency as well as this thing of it's very difficult sometimes. Because there's so many overlaps. With co-occurring conditions like with coordination. Expert II: With maths or symbols with handwriting you know so there's just quite a lot of overlaps with other things. And it was this particular student that I thought the way i'm doing things with with her is not working, and I don't really know why it's not working, because she was an intelligent girl, you know it wasn't that she wasn't capable of something, but things were not clicking. In the right way, so I had to think about how would I teach her differently. Would that make a difference, would that be helpful for her and that's where I became interested.

I: Well it's a lot, maybe you're interested in learning about dyslexia.

Expert II: Well, just wanting to know how to develop strategies as a teacher to help dyslexic students.

I: So, in your experience with people with dyslexia, when do you think most of people are diagnosed with dyslexia, and what prompts them to be the backbone.

Expert II: Could you just repeat that one more time.

I: Okay, so your experience when do you think most of people are diagnosed with dyslexia, and what prompts them to seek a diagnosis.

Expert II: Well there's a huge variation huge i've interviewed someone who was doing his PhD and his supervisor said to him, please go and get tested, because I think you've got dyslexia, and that was what he found out at the age of you know, like 43 or something. Other people have parents with dyslexia, so the parents recognize when the children are quite young or the school picks up on it.

Expert II: A huge barrier is the cost of assessment, so I think there are a lot of undiagnosed people because they don't have the funds to be assessed.

Expert II: And then, of course, if they're not assessed they don't have they don't qualify or they're not eligible for reasonable adjustments and accommodations so you know I think most of them are prompted to to seek a diagnosis, probably when some a teacher at school, recommends it and possibly just one they really have to work so much harder let's say then maybe someone else to do the same thing and then they you know there's this realization that perhaps with the extra time or perhaps with these reasonable adjustments, they could do a lot better on exams.

I: So do you have any experience or knowledge about specific this like the diagnostic approaches, so do you find the people who are motivated or unwilling to do that test that to confirm that they have dyslexia.

Expert II: I think there's a huge variation in how people view diagnosis, I know a lot of people sort of think oh I don't want to do it, I suspect i'm just dyslexic but I don't want to have the exam because if i'm not then that might mean i'm just slow or stupid, you know to me and other people feel like you know it's a relief when they find out that dyslexic. So there's I think there's a huge variation of how people feel about the testing, I myself don't have experience diagnosing some with. Someone with dyslexia, but i've certainly seen several reports and I have had an interview with an educational psychologist who does testing. And so it's been explained to me, and you know I realized there's some pitfalls in the way people are tested, because then their scores might average them out.

Expert II: To be mild but they may have severe processing problems or severe sequencing difficulties and those don't sort of show up in the overall thing, so I think it's really important to have kind of like a defined diagnosis and I, and I know one thing that the educational psychologist said, which I thought was really, interesting was that she hoped that, when she had an assessment with a student that they went away understanding themselves better and understanding dyslexia better and and feeling good about themselves through that.

I: have you got any experience with people who might be avoiding getting a dyslexic diagnosis, so what work their reasons for avoiding.

Expert II: So, as I said they were afraid that if the if the day notice was negative, then they were just kind of not very intelligent or something, you know that there must be some other reason, and they would feel guilty, maybe about that or feel bad about themselves so and then I think another barrier is cost for some people. You know it's extremely expensive and it's not possible for a lot of people to get that diagnosis.

I: This they sell was discovered, many years ago, but it is still relatively poorly understood by the general public, you agree with that, if so, why do you think that might be.

Expert II: I agree with that, I think it's a very complex issue, and you know as soon as parts of it are understood or things come out about the superpower of dyslexia, and things like that that these theories and ideas that are that tried to explain something that's very complex.

Expert II: And Actually, I think, as time goes on, I think, scientists will understand a lot more with the brain imaging research and other things like that, and I think we're going to find that a lot of our approaches and a lot of our.

Expert II: You know, ways of working and viewing dyslexia or not correct, I think that will find that in the coming years, and I think also that this age of technology is just fabulous for dyslexic people because they can have things put in different formats

that you know might be easier for them to learn the problem is in the application of that in the educational system.

I: Have you ever come across misconceptions and misunderstandings about dyslexia, so what sort of thing.

Expert II: I have a whole section in my PhD on assumptions that teachers make about students with dyslexia, and one of them is just that are dyslexic students are the same.

Expert II: which we know is not true because it's occurs across a huge spectrum and different dyslexic people will struggle with different aspects of learning music or reading or you know school and the other is that there's sort of blanket solutions like the color overlays is one example, that that will always work with students and that's just simply not true. So there's a lot of miss application of strategies. What are some of the other assumptions i'm trying to think so yeah that all dyslexic students are the same, I would say that I should have it in front of me. there's a few more, but I mean I think those are the key you know that we need to be very individualized and personalized in our instruction with dyslexic students.

I: So, how would you describe dyslexia to people who have bias against it.

Expert II: I would put an emphasis on the fact that it's different for each person. And you know we just have to work with the person to find what works best for them, and if that involves trial and error. You know and and paying close attention to the student experiencing stress or showing signs of stress.

Expert II: Because obviously that's just not going to be helpful, so I think those are those are some key things I would probably just put an emphasis on the fact that it's a spectrum condition that you know that a student does have a lot of dyslexics do have strengths and we can build on those and we don't have to focus our attention on the aspects that they find challenging we don't have to overlook them either so i'm not saying you know.

Expert II: I think it's just a lot of balance that's needed, you know.

I: Well, what do you think is the most effective way to raise public awareness about this like yeah.

Expert II: Well, interestingly enough. I think, working with organizations like the BDA is really good because they're sort of looked to in the UK as an authority.

Expert II: So I think you know advocating and volunteer with them that's that's a way i'm trying to change public perceptions and i'm going to be representing them at a family day in London in September. But I think also you know from my research is has been about music education and they are I have interviewed dyslexic musicians in top

orchestras. So top international orchestras in top international singing groups, but they don't want anyone to know that they have dyslexia.

Expert II: And I think that stigma has to be taken away so one of the things I want to do is see a documentary made about dyslexic musicians, because to my knowledge there's never been one made. And so I've been I've been looking for funding and my supervisor and I've been searching for funding for something like that, but, as you know, it's not that easy.

I: it's so interesting because of the ink.

I: Through my research process I also watch like some talking mentoring and made like they always like how from like children's perspective, like the god like yeah or. there's one in Japan, about the adults who diagnosed with dyslexia, but not really like certain like kind of job that this like just like that people into. it's interesting.

Expert II: I think the UK is one of the leaders in dyslexia research which is interesting because you know I never went into started doing my masters or started teaching piano with the idea of doing something like this, but yet here I learned in the place where you know there's been already at quite a lot of research so.

I: End of the documentaries I watched actually a lot of like made by the UK so, as you know, I wanted to find a game of your experience to help the public to better understand dyslexia, what do you think of this as an idea.

Expert II: I have very mixed feelings if I'm honest, because I know, one of the things that we do in our presentations with the music committee for the bda is that someone has put together a dyslexic simulator sort of thing. Of note it's not not anything like you're planning it's just sort of like they show some letters mixed up rearrange like within words and ask people to try to read it, and then they say, well, that could be what it's like for someone with dyslexia trying to read it, and again I feel like, here we are trying to simplify this very complex thing which, for some people can be about processing reading. For some people can be about processing mathematics symbols, for some people, it can be about coordination, more or you know physical spatial awareness and things like that. Expert II: For other people, it can be you know self-esteem can be such a huge part of it as well, so how do you how do you. Put into someone else the experiences of maybe being stigmatized or being overlooked or being treated as if you're not capable of doing things when you are. But you just need to be taught maybe in a different way, so I have very mixed feelings about it I'm not saying that it couldn't work but also the fact that dyslexia is a spectrum, so you know I do go to be showing different like sort of ranges of the spectrum, or just one spectrum so Those are some of my thoughts I'm sorry that doesn't sound like.

Expert II: I'm very curious to see how it works actually I really like is there are my concerns of it, because the things that I've personally and with dyslexia, and I got more concerns about.

I: If it's like maybe offensive or like creating this type of content to show like the public, maybe it's like to like open them to the people with dyslexia about it.

Expert II: Probably the thing to do would be to test it with as many dyslexic people as possible, maybe I don't know and see what they think does it relate to their experiences. And then, even then, can we really have an understanding of what it's like. Because you know, one of the things that I find dyslexic students doing and and i've spoken to like dyslexic parents as well, and you can sort of see them doing this as well it's kind of like covering up the difficulty and pretend things okay. So I think that happens, quite a line, how do you put yourself in the shoes of someone who goes into a situation, and they have to kind of prete nd.yeah that's very stressful. You know, to feel like you're almost anticipating you're not going to get it, the way that they're teaching it, you know. And again, just so difficult because it's not something we can overly simplify.

I: So what sorts of things, would you suggest that we know.

Expert II: I mean, to be honest with you, it could be really interesting to see it as it like a diagnostic sort of tool but you know. So it'll be mainly about literacy is that what yeah it's difficult for me to sort of shift my thinking to literacy issues, because I am mainly focused on the music part of things, but of course i'm aware of for some people is about visual stress, you know, so I suppose you could show elements of that I know some people have described what it's like what you know what they see. So that can be in perhaps could be in elements. I think a lot of things it's the automated city and the slow processing that are difficult and I don't know how you would represent that but you know you just think they have to have things sometimes read or done a very slowly, but then they've got it and things sometimes a better if they're broken down into smaller concepts, so that can be an overload of information, you know that. So, however, you could represent that in a game, just like you know information kind of coming from every direction and there's poor working memory. So you know just how much can the person hold and use at the same time, that would affect you know I don't know how you would put it into game for that, but you know those would be elements that would be interesting for other people to maybe experience somehow.

Appendix E: Interview Transcript with Expert III

I: Okay, so let's start the first section of questions, these are about how you learn about dyslexia to start off with what the term dyslexia means to.

Expert III: dyslexia to me so i'm a psychologist by training so dyslexia to me means a neuro developmental disorder of the relationship between what words sound like what language sounds like and how it's written down. And that that can happen that can be different breakdowns in that relationship for different people.

I: So, how did you first learn about dyslexia.

Expert III: Well i'm dyslexic myself, so I don't really remember when I was a child, the term wasn't used it was just, it was said that I had difficulty spelling things and then, when I went to university, I was studying psychology and I guess, I read about dyslexia, and so oh that's what I found. Is that I, I read a lot more about it, and when I was doing my PhD I read quite a lot about it.

I: So what made you interest in learning deeper about dyslexia.

Expert III: And because I realized I had particular problems with spelling and the interesting thing for me is I speak English is my native language but I grew up in a French speaking country and I don't seem to have dyslexia in French, but I have dyslexia, in English, though, I was interested. To read about what dyslexia, is what causes it and why would I have it in one language and not another and also psychologists are always interested in. What causes things and I realized, there are probably several other people with dyslexia in my family, although they weren't diagnosed as being dyslexic but they had difficult it's.

I: Just That was really interesting to know because I kind of have come through a similar background.

I: My language is Chinese and I can languages English now but I found the dyslexia English instead of my first language.

I: And that, when I go through these tests, I always confused with the fact that is that because I did the test in English that's why diagnosed as.

I: Like I really have the difficulties in reading and I'm selling like different language and the like, how did you know about it, by the way it just really curious.

Expert III: How did I know about what.

I: How do you notice about like you don't have the French plain English you got dyslexia.

Expert III: Well i've always been aware that I have great difficulty, spelling certain kinds of words in English and, from time to time I try and keep a diary of what the words are but it's really hard, because I can't write them down because I don't know how to spell them. In when you when I learned French I did French, so I lived in the French speaking part of Switzerland as a child and I learned French kind of you know just naturally growing up, but then, when I went to university I did French university and one of the things at university is, you have to take dictation and because and it's interesting because in French. When you speak a lot of the words the ending of words sound the same but they're written differently, and you need to know the grammar to

know, have a going to be. Written So if you say you for a fair question shows that means I wanted to something, it would have a fair crushers he wants to do something, so the food CAFE sounds the same, but when it's should play it ends in an s and when it's delivered a it ends in a tea.

Expert III: it's now I think it's because I learned it properly at university, I have no difficulty, I can take French dictation I got very high marks.

Expert III: In French I got there I always had nearly perfect dictation and then I thought I couldn't do that in English, I couldn't I can't.

Expert III: When I go to a lecture I can't take notes, because i'm listening to what the person saying, but I can't write down what they're saying, because I don't know how to spell it. And I think that's I can understand why you have difficulty in English because, although I believe every this. There is dyslexia all over the world, regardless of what language people speak, I think that it's known that there's more dyslexia in the English speaking world because English spelling is so mad at.

Expert III: there's no other word for it, you know it's just mad.

I: Maybe i'll possible because of the Western countries that the dyslexia related study way earlier than the Asian and other countries.

Expert III: Yes, but I think that's because there's more dyslexia. I mean it's it's really the Anglo Saxon countries United Kingdom United States, Canada, Australia, they started the research on dyslexia and it's because we have a lot more dyslexia then say China role or Spain, for example, so I mean, and also, I think. it's also a problem. In even countries like the UK with there's a lot of research. But there's still a lot of misunderstanding which I think what you're doing is really good that are people with dyslexia just you know they're not very clever they can't spell they can't read so there's a lot of bridges as well.

I: So what experience, do you have either professionally or personally with people with dyslexia.

Expert III: Well, I I do research on dyslexia, so I i've met quite a lot of dyslexic people but, and when I have students with dyslexia, I always try and talk about to them about well. I haven't used Alexia will cause you some problems but they're all it's also been shown that people with dyslexia very can be very creative so it's also an advantage, you shouldn't just think of it in a negative way, so I try and I talk about my own dyslexia. I was very lucky, because my mother. So well she's got difficulty spelling but i'm you know my mother taught me how to spell as much as she could so she helped me and she wasn't negative about it so that was good.

I: yeah so in your experience when do you think. Most people are diagnosed with dyslexia, and what prompts them to seek a diagnosis.

Expert III: Well, in countries like the UK and Australia Now people are usually diagnosed at school quite early I mean I was diagnosed very late which is perhaps more typical when I was young, but if people are slow at learning to read or to spell then usually they'll get tested and get a diagnosis of dyslexia, I mean in the UK that can be a bit slow in Australia that's quite fast, but I think there are lots of people. Because there are lots of wonderful things about dyslexic series, there are lots of different ways. You can be dyslexic so one of the reasons I wasn't diagnosed at school is I don't have any problem reading. I can read quite fast and quite accurately it's only if you asked me to read aloud that I then become don't do it very well, and when I was at high school, I wanted to act. And, but when I auditioned I never got the part because if you give me a text and say right read this I can't I can't read it well enough out loud, so I don't sound very good, but once I learn it then actually I think I can act. So there were indications, when I was a teenager that I had dyslexia, but the school never picked it up. And they could have done, and it was only me at university then realizing what the problem was, and I think there are probably lots of people like me who. They get through the system, the school system, particularly if they're pretty smart and but then maybe they realized themselves or something happens in their lives that they get a gut realized or get a diagnosis.

I: So do you have any experience or knowledge about the specific dislike set diagnostic approaches If so, to find people for motivated or unwilling to do this test to confirm that they have dyslexia.

Expert III: And my experience is people are willing now mean the diagnostic approach that i'm familiar with, is to have a professional person. Usually in educational psychology just give you a number of tests of reading and writing and talk to you about the problems you have, and when I was at university I didn't want anyone to know I had dyslexia I didn't tell anybody. Whereas now if you if you say you have dyslexia you'll get good support at university at school, so I think people are much more willing now to come forward and be tested. I mean, I think the problem is sometimes if a child is a bit slow at learning to read or to spell, then the parent will say oh they're dyslexic and wanting to get them tested when maybe they're just a bit slow it's not dyslexia, so I think there's a bit of a problem with pushy parents.

I: So, have you got any experience with people who might be avoiding getting a dyslexia diagnosis, so what were their reasons for avoiding diagnosis.

Expert III: that's an interesting question. No, I don't think I have, I mean I heard about people who don't want to be who might have dyslexia, but I don't have any personal experience, no I can imagine that. People don't want to be labeled but yeah No, sorry don't have any experience.

I: Okay yeah and dyslexia was discovered, many years ago, but it is still relatively poorly understood by the general public.

I: Do you agree with that, if so, why do you think that might be.

Expert III: Yes, I agree with that, I think the trouble is. Two things first of all because it's a relationship between how words sound and how they're written there's different ways that that relationship can break down so some people I know her dyslexic have great difficulty reading text and they say the text moves around so that seems to be a problem between looking at the written word and knowing what it means. I don't have that problem at all, but I can't I I my problem is in the other direction, I can hear a word, and I know what it means I don't know how to write it down so you've got three things you've got what it looks like when it's written down. you've got what it sounds like and then what it refers to so you've got cat cat is a small animal cat.

Expert III: In English sounds cat and then it's written down and all kinds of things can go wrong, between those three things and I think people. The general public only hear about one version they hear about the version, where you can't write. The other problem is there are a lot of other problems that are not really dyslexia. But associated with dyslexia, and I certainly have some of them, so people with dyslexia often have difficulty telling left from right they have for spatial orientation. They often have to, we will be getting things in the right order so when I do spell things I often have to write letters, but I put them in the wrong order. And all kinds of things and it's not it's and I actually don't understand how some of this relates to dyslexia, but it's not dyslexia. So people get really muddled up between and and I think this is also a problem of parents their child has difficulty with spatial orientation, so they think oh he's he or she is dyslexic i'll get them tested but spatial orientation is nothing to do with dyslexia. And the science, you know when you look at the scientific research that's very clear, so I think. Expert III: It may be the people we don't we don't really know what it is in our brains, but it's something in our brains it's a bit different. From the rest of the population and perhaps because we have that difference, we also have different we're likely to have differences to do with other things, but, for example, my husband.

Expert III: Is not definitely not dyslexic but has it normally has more difficulties, and I do telling left some right. And yet i'm told I can't tell it from right because i'm dyslexic and I think no I can't he can't tell it from like I can't tell it from right we.

Expert III: Were hopeless trying to give each other directions, but he's not dyslexic and I am so I think that's why there's a lot of confusion in the public and I still think a lot of the general perfect thing people who are dyslexic are just that's an excuse they're not very clever enough or they're not they're not working hard enough to learn how to spell.

I: I think that's the most I heard. Most people think, have you ever come across misconceptions and misunderstandings about dyslexia, if so, what sorts of things to people think that are incorrect.

Expert III: Oh yes. For example, I've heard people say Oh well, if you've got a spell check it's it doesn't matter whether you have dyslexia, because the spell check can tell you how to spell things that it's not total nonsense, because a spell check does help me yeah awesome a spell check doesn't help me because I can hear the word like a word like concatenate. I don't know how to spell it and I don't know what to put into spellcheck just.

I: Oh it's good.

Expert III: So I think people think that technology, you know, so the problem and it it different things, help when they don't solve the problem.

I: So, how would you describe dyslexia to people who have bias against it.

Expert III: I would say.

Expert III: it's not to do with intelligence it's to do with my brain having a problem with the connection between the sounds of words and how to write them down, and I can think about words, the same way, everyone else does, but I just can't write them down quick. And that lots of people with dyslexia have problems reading, but not all of us, because I don't have any problems reading.

I: So what do you think is the most effective way to raise public awareness about this like sale.

Expert III: I think explaining what it really is, and the different ways, you can be dyslexic I think it's also really good that a lot of very successful and clever people who are dyslexic have come out and said, Sir, Richard Branson is dyslexic and I'm always amazed at various actresses and actors are dyslexic. And, given the I was very keen on acting and I couldn't get anywhere, because I couldn't audition, I think how did they do that so so but yeah just explaining what it really is and that's not to do it intelligence it's just kind of quick.

I: Okay, as you know, I wanted to design a game of vr experience to help the public to understand better about dyslexia, what do you think of this as an idea.

Expert III: yeah I think it's a good idea games are always a good idea, and if it gives people an understanding, I think it's a really good idea

I: what would you suggest that we can include it in the game.

Expert III: Well, I think it would be good to have different.

Expert III: characters if you're going to have characters with dyslexia that it's not just one form of dyslexia that you show. Different types of dyslexia, and also these other things like being able to not tell Left and Right and put things in the right order. That

you show that some people with dyslexia have those and other people don't have those I think, to give a you know, a fully impression of what dyslexia is like that it's not just not being able to read.

I: Okay, so thank you very much for talking with me today that's all the question I have do you have any questions for me about the study i'm doing.

Expert III: So you're gonna make a game now is that part of the project.

I: I think I don't have enough time to make a game, as the practical things, but I will make the game concept.

Expert III: Good luck with that yeah.

I: thank you again, I really appreciate your participants.