

Assessing writing skills in Higher Education: speed, legibility, and quality

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Abstract

Writing and transcription skills (handwriting and typing) are critical throughout education and in employment. The use of robust assessment tools contributes to the identification of and support for individuals with writing and transcription difficulties. In this paper we outline practical ways to assess the speed and legibility of handwriting and to evaluate written composition skills. Application of the DASH17+, Handwriting Legibility Scale and Writing Quality Scale with scripts from 17-25 year olds are examined. The presentation of two case studies illustrates how this suite of tools provide a practical and holistic assessment of writing and transcription, useful for intervention planning.

Key words: Handwriting, Typing, DASH17+, HLS, WQS, Dyslexia

Statements and Declarations:

Declaration of Competing Interests

Anna Barnett is the author of the DASH17+ published by Pearson.

Funding

This research was funded by an Oxford Brookes University Research Excellence award to the second author.

Acknowledgements

The authors would like to thank Karen Gurney for her assistance with scoring the data.

1. Introduction

Writing is an important tool for communication and a significant amount of time is spent in education in teaching writing skills. The 'Simple View of writing' (Berninger & Amtmann, 2003) provides a useful framework for understanding the language, cognitive and motor processes that are involved in writing and how they interact. The 'Simple View of Writing' framework has been developed based on research with English speaking children in primary and early secondary school. This framework conceptualises the

writing process as consisting of two primary components: transcription skills and text generation skills. Transcription skills refer to the processes needed to represent sounds as written symbols and includes handwriting (and typing) and spelling. Text generation refers to the organisation of ideas into words, sentences, and paragraphs to produce the written text or discourse. There is also a third component that involves Executive Function skills which are needed for planning, monitoring, reviewing, and editing what has been written. Each of these three components are supported by working memory.

The 'Simple View of Writing' framework helps us understand both the component skills involved in writing and the relative contribution of each during development. For the young child learning to write, transcription (i.e., the physical formation of letters to form words on the page) will take up much of the available working memory resources and capacity. In terms of text generation, young children are found to focus more on writing what they know about a topic, with very limited involvement from higher level Executive Functions skills such as planning and revising (Graham et al., 2007). As children get older and transcription skills become more automatic and the cognitive load of the lower-level transcription skills involved in writing decreases, Executive Functions skills begin to play a larger role in the writing process. Young writers will therefore start to move towards a knowledge-transforming strategy and, as they use more higher-level Executive Function skills, they will be able to focus more on text generation and the global structure of the text, resulting in a greater overall coherence (Berninger & Amtmann, 2003; Sumner et al., 2016).

In terms of handwriting, there are two elements that can be examined: fluency or speed and legibility. Fluency or speed refers to how quickly students can write and is usually measured as the number of letters or words produced in a specific time period and on differing tasks (e.g., copying or free writing). Legibility is more difficult to define but is generally linked to the 'readability' of the writing as a whole and the ease with which the individual letters and/or words are recognized (Rosenblum et al., 2004).

However, successful writing involves not only mastery of the lower-level transcription skills but also the skills involved in text generation that are required to produce a coherent and cohesive text. This will include not only the way in which ideas are developed and structured, but the appropriateness and variety of the vocabulary chosen to express those ideas, and the production of sentences that follow the standard conventions or 'rules' of English, including the correct use of punctuation. As children move through education, their vocabulary increases and their knowledge of how to use language to effectively communicate their intended message in different contexts and to different audiences develops.

For most students in Higher Education (HE) writing skills will be secure but for some students the writing process continues to be a challenge, with difficulties experienced in transcription and/or in the composition

and quality of the writing. For example, difficulties in the accuracy and fluency of writing letters or spelling words (transcription skills) can interfere with the higher order Executive Function skills required for the planning and generation of extended text. Oral language skills may also interfere or constrain the ability to transcribe ideas and thoughts into written text (at the text generation level). In 2021-22 students with specific learning difficulties (SpLDs) accounted for 6.15% of the HE student population in the UK and for 33% of the student population with a known disability (Higher Education Statistics Authority, 2022). As part of an assessment for SpLDs, identification of difficulties in writing is key to ensuring equal opportunity and it is important that appropriate adjustments are put in place for students in HE to ensure they are not disadvantaged compared to their peers.

An increase in the use of technology (i.e., personal computers, laptops, tablets) in schools and colleges has resulted in a reduction in the need for, and practice of, handwriting. In HE most coursework is now typed and submitted electronically. However, assessment via a handwritten examination, where there is a requirement to produce legible writing at a reasonable speed and to do so under time pressure is still used as a method of assessment. For students with difficulties with handwriting speed and/or legibility performance in exams can be affected. For example, handwriting fluency has been found to constrain overall performance in undergraduate examinations (Connelly et al., 2005) for students with slower handwriting fluency. In addition, handwriting legibility has also been found to affect how college student essays were evaluated, with more legible writing being evaluated more positively than less legible material (Greifeneder et al., 2010).

To identify and recommend appropriate support, at the time of writing, the current SpLD Assessment Standards Committee (SASC) guidelines for a 'Post 16 Diagnostic Assessment Report for SpLDs' (SASC, May 2022) include the following guidance for assessing writing and typing skills:

“A free writing task appropriate to the level of study / work, should be given and analysed, to provide information about qualitative features such as grammar, sentence complexity, coherence, vocabulary choice, spelling accuracy, writing speed and handwriting legibility. Pertinent aspects only of writing performance should be reported and should be related to the relevant educational / work environment and to the SpLD(s).

A copying task should also be given so that difficulties relating to motor skills and the process of composition can be teased apart.

It might be relevant to sample typing speed and accuracy.”

This guidance highlights the importance of not just handwriting speed and legibility, but also the compositional aspects of writing: grammar, sentence complexity, coherence, vocabulary and spelling accuracy. However, the availability of standardised tests for assessing writing skills in HE students is limited. The standardised DASH17+ (recommended by SASC) allows the assessment of handwriting speed in 17-25 year olds. The Wechsler Individual Achievement Test, Third UK Edition (WIAT-III^{UK}, Wechsler, 2017) allows for a more comprehensive assessment of essay composition writing skills but requires another sample of free writing on a different topic to that used in the DASH17+. To our knowledge there are no other tools that are both quick and easy to use, that allow for assessment of writing legibility and quality in this age group.

Aim:

The aim of the current study was to examine whether the DASH17+ and two newly developed criterion referenced tools, the Handwriting Legibility Scale (HLS; Barnett et al., 2018) and Writing Quality Scale (WQS; Stuart & Barnett, 2023) could distinguish between a group with and without dyslexia in HE. Two case studies are also presented to illustrate how information from the three assessment tools could provide information to help in the identification and recommendation of support for students with difficulties.

2. Method

2.1 Participants

Twenty-eight students (11 male, 17 female) with a mean age of 19 years and reported to have dyslexia by the students themselves and by their dyslexic support tutors, were matched to an age and gender comparison group (see Table 1). These students were selected from the UK stratified sample for the DASH17+ and were selected from a range of schools, colleges, and universities across the UK, including England, Scotland, Wales, and Northern Ireland. (See Stuart & Barnett, 2023 for further details).

	Male	Female	Total
17-18 years	8	7	15
19-21 years	3	9	12
22-25 years	0	1	1
Total	11	17	28

2.2 Measures

The following three tests were used to measure handwriting speed, legibility and writing quality.

2.2.1 Detailed Assessment of Speed of Handwriting (DASH17+; Barnett et al., 2010)

The DASH 17+ includes four main tasks to measure speed of handwriting production: two sentence copying tasks which allow a comparison to be made between 'best' and 'fast' handwriting, alphabet writing and a 10-minute free writing task, in which students are required to write on the topic of 'My Life'.

2.2.2 The Handwriting Legibility Scale (HLS; Barnett et al., 2018)

The Handwriting Legibility Scale was designed to be a quick and practical tool that could be administered in conjunction with the free writing task in the DASH (Barnett et al., 2007) to measure handwriting legibility. The HLS involves the assessment of handwriting using five criteria (see Table 2) that have been linked to legibility.

Table 2

HLS Criteria

Criteria	Brief description
1 Global legibility	Based on a first reading of the text, how legible are all the words in the text.
2 Effort	Ease of reading on a first attempt, considering the effort required to read the script.
3 Layout	Organisation of the writing and consistency of the alignment of the writing with the margin, the spacing between and within words, the position of the letters and words on the baseline.
4 Letter formation	The shape, size, and slope of the letters and whether they contain all the necessary elements.
5 Alterations	Alterations to individual letters such as re-tracing or over-writing of letter.

The scores for the five criteria are each rated on a five-point scale and summed to give a total score (ranging from 5-25) with higher scores reflecting poor legibility. The total scores can also be categorised into low (5-10), medium (11-15) and high (16-25) scores, with those falling in the high category indicating that the writing has poor legibility and may require further attention and possibly support.

The development of the HLS was initially for use with primary and early secondary school aged children (ages 8-14 years). Reliability has been reported as good and the HLS has been found to be sensitive to gender differences and to identify students with SpLDs / Developmental Coordination Disorder (DCD) (Barnett et al., 2018). It has subsequently been translated and applied to other languages, including Hebrew (Fogel et al., 2022) and Czech (Safarova, 2023) and also applied to older age groups (14-16 years and 17-25 years) in the UK (Barnett & Stuart, 2023).

2.2.3 The Writing Quality Scale (WQS; Stuart & Barnett, 2023)

The WQS was developed for use with 17–25-year-olds in HE and designed for use with the DASH17+ free writing task. It has six criteria (see Table 3), with each criterion given a score between 1 and 4. These scores are then summed to yield a total score (ranging from 6-24) with higher scores indicating poor writing quality. In addition, once the overall WQS score has been calculated, a cut-off score was established to help the assessor in identifying poor writing quality performance. This then allowed for the identification of whether a script fell into the high (indicating poor writing quality scores of 17-24), medium (scores of 13-16) or low category (scores of 6-12).

Table 3
WQS Criteria

	Dyslexia		Age & Gender		p	Cohen's d
	n = 28		n = 28			
	Mean	SD	Mean	SD		
Speed (DASH17+) raw scores:						
Copy Best (words per minute)	22.50	7.47	26.09	4.68	0.036	0.58
Copy Fast (words per minute)	31.45	7.09	35.21	5.13	0.027	0.61
Copy difference	8.95	4.48	9.13	3.83	0.873	0.04
Alphabet writing (letters per minute)	66.96	24.50	88.68	19.65	<.001	0.98
Free Writing (words per minute)	23.14	6.33	26.13	4.47	0.046	0.55
DASH17+ Standard Score	90.68	17.29	103.54	12.28	0.002	0.86
Min-Max	63-127		79-125			
Legibility: HLS Total	11.14	3.21	9.61	2.33	0.045	0.55
Min-Max	6-17		6-16			
Quality: WQS Total	16.89	3.48	14.43	2.52	0.004	0.81
Min-Max	10-23		11-19			
Low Scores (6-12) % Scripts	14%		28%			
Medium Scores (13-16) % Scripts	36%		54%			
High Scores (17-24) % Scripts	50%		18%			

2.3 Procedure

The DASH17+ was administered and scored in accordance with the Manual. The DASH17+ 'free writing' task was also used for scoring legibility (using the HLS) and writing quality (using the WQS). Prior to scoring the scripts for quality using the WQS, the DASH17+ free writing scripts were transcribed and typed up (preserving spelling errors, crossed out words and noting where words were illegible) to reduce bias in scoring from poor handwriting (Graham & Weintraub, 1996; Greifeneder et al., 2010). A trained rater, blind to whether students had an SpLD or not, scored the HLS and WQS for all scripts, as part of a large sample of scripts (reported in Stuart & Barnett, 2023).

3 Results

Results from the DASH17+, HLS and WQS are reported below for the group of students with dyslexia and their age and gender matched peers. We then present two case studies of students with dyslexia.

3.1 Group scores: Students with dyslexia and their age/gender matched peers

The group scores for the three assessment tools are shown in Table 4. Significant group differences were found on all the DASH17+ tasks with the group with dyslexia producing fewer words and letters per minute than their age and gender matched peers. On the sentence copying tasks, both groups were able to speed up on the 'copy fast' task and there was a significant effect of condition (copy best, copy fast): $F(1,54) = 262.94$, $p < .0001$, and of group (dyslexia, age/gender): $F(1,54) = 5.53$, $p = .002$. However, no significant interaction between group and the copying condition was found $F(1,54) = 0.02$, $p = 0.873$.

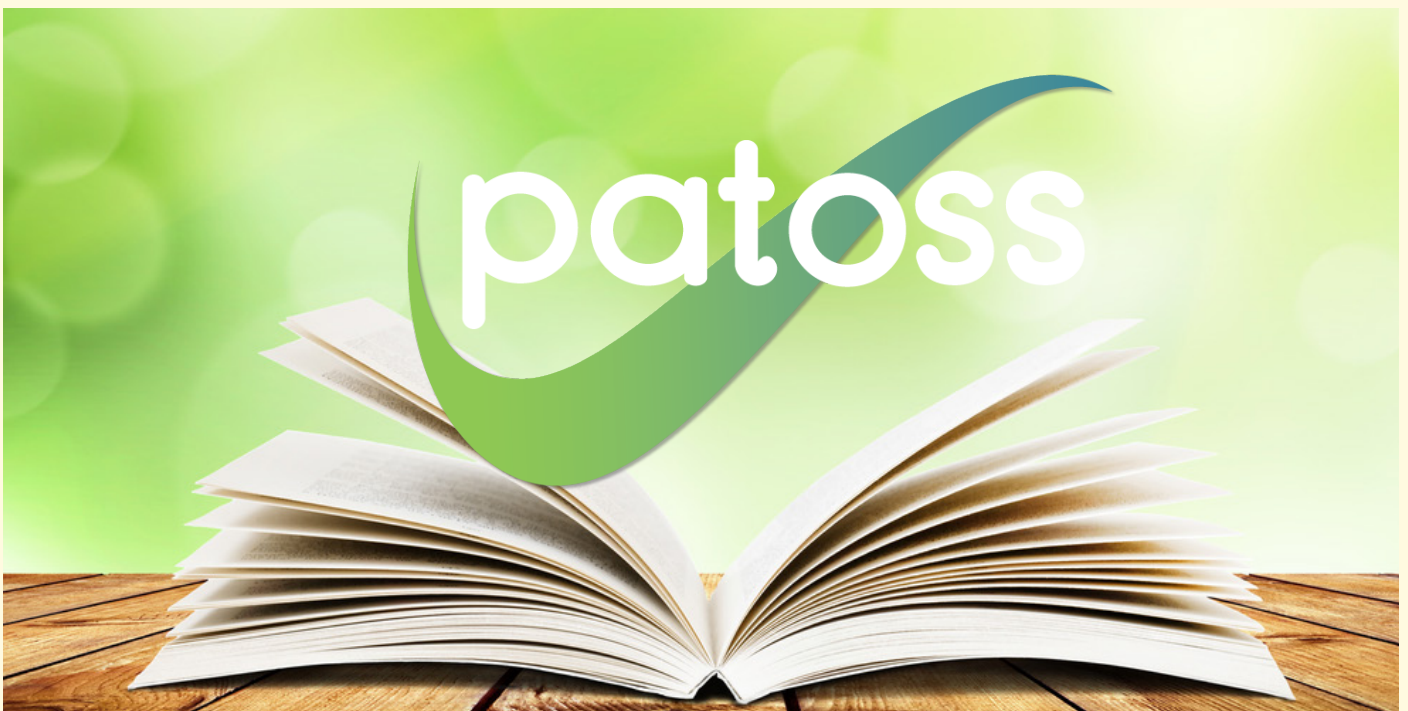


Table 4

Comparison of DASH17+, HLS and WQS scores for group with Dyslexia and their age and gender matched group

	Dyslexia		Age & Gender		p	Cohen's d
	n = 28		n = 28			
	Mean	SD	Mean	SD		
Speed (DASH17+) raw scores:						
Copy Best (words per minute)	22.50	7.47	26.09	4.68	0.036	0.58
Copy Fast (words per minute)	31.45	7.09	35.21	5.13	0.027	0.61
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Legibility: HLS Total	11.14	3.21	9.61	2.33	0.045	0.55
Min-Max	6-17		6-16			
Quality: WQS Total	16.89	3.48	14.43	2.52	0.004	0.81
Min-Max	10-23		11-19			
Low Scores (6-12) % Scripts	14%		28%			
Medium Scores (13-16) % Scripts	36%		54%			
High Scores (17-24) % Scripts	50%		18%			

The scores for the HLS and WQS are also significantly higher in the group with Dyslexia, indicating poorer performance. As a group, the students with dyslexia showed slower writing speed, poorer legibility and poorer quality in writing than their age and gender matched peers. These differences were significant (at or below $p = .05$) with medium ($d = 0.50$) to large ($d = 0.80$) effect sizes. The medium to large effect sizes found on each of the tasks indicate that the differences between the groups were substantial and meaningful, with the DASH17+, alphabet writing and WQS Total score producing large effect sizes.

3.2 Case Studies

In this section we report on two male students taken from the group with dyslexia and examine in more detail their individual scores for the DASH17+, HLS and WQS (see Table 5).

	Student 1		Student 2	
	Male 20 years		Male 18 Years	
	Raw	SS	Raw	SS
Speed (DASH17+)				
Copy Best (words per minute)	30.50	12.00	10.00	3.00
Copy Fast (words per minute)	34.50	10.00	15.00	3.00
Alphabet writing (letters per minute)	62.00	7.00	52.00	7.00
Free Writing (words per minute)	31.80	14.00	12.40	4.00
DASH17+ Standard Score		103.00		64.00
95% Confidence Interval		91-115		52-76
HLS Total (higher score = poor performance)	17 (high)		16 (high)	
WQS Total (higher score = poor performance)	18 (high)		21 (high)	

The overall total standard score in Table 5 for the DASH17+ for both students differ. Student 1 has a score of 103 (CI: 91-115) which is in the average range expected for his age, whilst Student 2 has a score of 64 (CI: 52-76) which is below the average range expected for age.

For Student 1, if only the DASH17+ was administered and speed of writing considered, then the conclusion might be that the student had no difficulties with handwriting. All scores for Student 1 are in the average range and when scoring the 'free writing' script for speed, only one word was discounted for being completely illegible. However, some issues with the legibility of the writing were evident on scoring the DASH17+ tasks and the total HLS score for the DASH17+ free writing script confirmed this, placing Student 1 in the 'high' range, indicating issues with the ease of reading and aspects of letter formation. The script is difficult and effortful to read (see sample of writing in Figure 1). Some of the letter formation is poor and placement of letters on the baseline is variable. For example, the 'h' in 'with' lacks a clear ascender, the 'y' of 'happy' sits on the baseline without a descender below the line. Some other letters 'float' above the line, are poorly formed or have missing parts. This all makes it harder work for the reader, and one has to rely on context to make out some of the words.

In terms of the quality of the writing, the content and development of material is good, and the student demonstrates they are able to extend and elaborate material. However, their overall WQS score is affected by their limited range of vocabulary and errors in constructing sentences and the correct use of punctuation. Whilst the meaning of what has been written can still be understood, this may become more of a challenge when required to write more academic assignments.

My Life

My life is amazing, no really it is. Im very happy with my life and I take things for granted way to much. I should be in lesson now but im not ... no im in a room writing my thought down on a bit of paper but heh I get paid so why not. ever since I left high school I just cant write. I dont know why but already my hand is hurtin their fore my hand writing is awful. in my life I enjoy lots of music and my favourite band is Blink 182

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In summary for Student 1, whilst handwriting speed was adequate, further examination of the legibility of the writing using the HLS and the compositional quality of writing using the WQS reveals significant difficulties that might impact on this student's studies.

In contrast, Student 2's overall total standard score of 64 for the DASH17+ is in the below average range expected for age. Handwriting speed on all the individual DASH17+ tasks was slow for the student with the exception of the alphabet writing task where the student's score fell in the average range. When scoring the 'free writing' script for speed, although some issues with legibility were noted, all words could be read and so were counted. However, examination of scores on the HLS show that, although the work can be read in context, it has received a total HLS score in the 'high' category, indicating issues with the ease of reading and aspects of letter formation. Some letters are inconsistently placed on the baseline (e.g., some 'y' and 'g' letters do not have a descender below the line). There is also inconsistency in the spacing of letters within words, with gaps in some places and letters too close together in others.

My Life

This is about my life well my life is always busy iam 18 years old (19 in less than a month) I am studying at [redacted] // where I am taking a Btec national diploma in performing arts. I also have a strong passion for technical theatre and that is something I wish to study at university or at a drama school. I am also putting on my own show in college this show will be // the Rocky horror picture show which I am to put on in [redacted]. I have also taken part in a // cross college (people who don't just study performing arts) which has a production manager of Les Misérables which was a huge success.

My Life*

This is about my life well my life is always busy iam 18 years old (19 in less than a month) I am studying at [redacted] // where I am taking a Btec national diploma in performing arts. I also have a strong passion for technical theatre and that is something I wish to study at university or at a drama school. I am also putting on my own show in college this show will be // the Rocky horror picture show which I plan to put on in [redacted]. I have also taken part in a // cross college (people who don't just study performing arts) which has a production manager of Les Misérables which was a huge success.

The free writing script produced is very short compared with those produced by the age and gender matched peers (and with Student 1). In describing their life, the student focuses on what they are studying

and their plans for the future, but it is 'list like' and content is not elaborated. The text lacks structure and whilst appropriate words are selected to convey meaning, the vocabulary used is limited in range. The sentences are simple in structure and alternate between sentences starting with I am ... and I have ... which add to the 'list like' feel of the text. Lack of appropriate punctuation also impacts on the meaning and coherence of what is written, and the use of capital letters is also inconsistent. The text contains several spelling errors consisting of letter reversals, omissions, or additions.

4 Discussion

Difficulties with writing extend beyond the school ages and can emerge later in life when the demands of independent study and writing to specified word counts and deadlines and /or writing under timed conditions become more challenging. There is evidence that in HE, writing speed and legibility can constrain performance in undergraduate examinations (Connelly et al., 2005) and that poor legibility can result in lower marking evaluations (Greifeneder et al., 2010). Assessment of both speed and legibility are therefore important to ensure that students with handwriting difficulties are offered effective support to avoid academic underachievement.

In response to a lack of suitable assessments and requests from PATOSS members for some additional guidance on how to go about assessing writing skills in students in HE, we developed two criterion referenced tools; the Handwriting Legibility Scale (HLS; Barnett et al., 2018) and the Writing Quality Scale (WQS; Stuart & Barnett, 2023). Both tools were designed to not require additional tasks to be administered in an assessment for SpLDs and to make best use of information already typically collected through using the SASC recommended test for assessing handwriting speed, the DASH17+. Thus, handwriting legibility can be more systematically explored through using the HLS on the free writing scripts from the DASH17+. In the same way, having assessed the free writing script for legibility, it can then be assessed for its written compositional quality using the WQS.

The comparison between a group of students with self-reported dyslexia and their age and gender matched peers demonstrated that both the HLS and WQS criterion referenced tools were sensitive enough to differentiate the group of students with dyslexia in terms of their poor handwriting legibility and written compositional quality of their free writing from their age and gender matched peers. Furthermore, the two case studies of students with dyslexia that were presented illustrated how the HLS and WQS can provide useful additional information to that collected on handwriting speed from the DASH17+ for assisting the

assessor in making recommendations for access arrangements and support. However, it is important to remember that individuals will vary, and the case study of Student 1 illustrates this in terms of the student's handwriting speed falling in the 'average' range but there being evidence of difficulties with legibility and compositional quality that may impact on their studies. Student 2 in contrast showed difficulties with speed, legibility and the compositional quality of their writing. In summary, the case studies illustrate how the HLS and WQS provide lots of additional information to better help the assessor to work out where particular difficulties may lie. In the limited space available here we have highlighted how the DASH17+, HLS and WQS can be used together to provide a holistic assessment. In practice, further detail from each of these tools can be examined, alongside other information available about the student, their course of study and the teaching and learning environment, to make decisions about how they can best be supported.

It is acknowledged that this paper has reported on a small sample of students with dyslexia and that groups of students with dyslexia are often heterogenous, in terms of the types of difficulties experienced and their severity, whether these difficulties extend to writing and whether they also have other co-occurring difficulties. This heterogeneity was seen in the range of scores achieved by the group of students with dyslexia for the three assessments tools.

4.1 Implications for professional practice

We have illustrated how two new tools can be used alongside existing information routinely collected as part of an SpLD assessment. Used together with the DASH17+, the HLS and WQS are quick and easy to apply and score. It is hoped that these new tools will be useful for assessors in their professional practice, by providing information to help understand and support those with writing difficulties.

Copies of the HLS and WQS score sheets and additional resources are freely available from the following website: annabarnett.co.uk

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