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The Readability of General Practice Websites

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Abstract

Background: General Practice (GP) websites are an increasingly important point of interaction, but their readability is largely unexplored. 1 in 4 adults struggle with basic literacy, and there is a socioeconomic gradient. Readable content is a prerequisite to promote health literacy.

Aim: To assess GP website readability by analysing text and design factors, and to assess whether practices adapted their website text to the likely literacy levels of their populations.

Design and setting: All GP websites across Scotland.

Method: Text was extracted from five webpages per website and eight text readability factors were measured including Flesch Reading Ease and Flesch-Kincaid Grade Level. The relationship between readability and the Scottish Index of Multiple Deprivation (SIMD) measure of a practice population's level of deprivation was assessed. Ten design factors contributing to readability and accessibility were scored.

Results: 86% (813/941) of practices had a website. 22.9% (874/3823) of webpages were written at or below the government-recommended reading level for online content (9-14 years old), and 77.1% (2949/3823) had a higher reading age. 80.5% (3077/3823) of webpages were above the recommended level for easy-to-understand 'Plain English.' There was no significant association between webpage reading age and SIMD. Only 6.7% (51/764) of the websites achieved all design and accessibility recommendations.

Conclusion: Straightforward changes to practice websites could improve readability and promote health literacy but will require resources and support. Failure to provide accessible websites may inadvertently contribute to the widening of health inequalities. This is increasingly important as the move to online services accelerates.

Keywords: General Practice, Primary Health Care, Health literacy, Digital Divide, Online Systems

How this fits in

GP's are encouraged to make more services available online, yet poorly written or produced websites can inadvertently create a barrier to accessing healthcare and widen health inequalities.

In the largest study on website readability, all 813 GP websites in Scotland were reviewed and most (77%) were more difficult to read than the government-recommended limits.

Websites were not adapted to their local population's likely literacy levels, and only 6.7% met design and accessibility standards.

Websites should be written as if writing for a 9-14 year old and simple measures can be taken to improve design and accessibility, but practices will need resources and support if this is to be achieved.

Introduction

General Practice (GP) websites are an increasingly important source of information and provide the first point of interaction between patients and healthcare providers, yet there has been no large-scale research that assesses how understandable GP websites are to their practice populations. Most GP practices in the UK have a website and there is impetus from government to increase the provision of services that GPs offer online, such as appointment booking and repeat prescription requests(1, 2). In Scotland it will soon be a requirement for all practices to make information and services available digitally(2). This process has been accelerated by the COVID-19 crisis(3, 4).

The basis for GP websites is commonly the practice leaflet, a contractually required document that provides information about the services, opening times, appointments, prescriptions, data protection and staff(2, 5, 6). A small number of website providers operate in the primary care market, with one company supplying nearly half of the GP websites. Consequently, many websites are similar in basic design and structure.

As patients are sometimes required, and increasingly expect to interact with health services via the internet, poorly produced websites can create a barrier to accessing healthcare. The comprehensibility of text is often termed 'readability.' Readability is 'the ease with which a text may be scanned or read(7).' Text factors such as word length or the number of syllables in a word, and design factors such as line spacing and typeface influence readability(8-10). Context is also important. Familiar formatting, for example opening times written in tables, may make otherwise difficult information understood(9, 11).

Readability matters because in the latest major review of adult literacy 16% of the English population were only be able to comprehend short sentences and identify single pieces of information if they were identical or synonymous with the information in the question(12). Similar results were found in Scotland(13). Healthcare jargon and context adds further complexity, even for those with otherwise good literacy(14). Forty three percent of written health information is too complex for UK adults to fully understand and rises to 61% when numerical information is included(15). Health literacy has been defined as the skills of individuals to 'gain access, understand, and use information in ways that promote and maintain good health(16).' However, in order to promote health literacy, text must be readable(17).

Low basic and health literacy are associated with higher socioeconomic deprivation(13, 18). In Scotland, those living in the most deprived 15% of areas according to the Scottish Index of Multiple Deprivation (SIMD) were twice as likely to only reach the basic literacy level compared to those in all other areas(13). Computing literacy also varies with socioeconomic status, as the most deprived are least likely to be able to use, have access or know about online services(19-21).

The NHS Information Standard states that providers have a duty to take "into consideration the health literacy and/or accessibility needs of the population" that they serve(22). Ensuring information is understandable is vital to enable equitable access to health services.

This study assesses GP website readability by analysing text and design factors, and whether readability varies according to the SIMD measure of a practice population's level of deprivation.

Method

We used the publicly available Scottish Government's Information Services Division (ISD) list of all GP practices in Scotland, ranked in order of the percentage of each practice population's level of multiple deprivation as measured by the SIMD(23). The SIMD is calculated by dividing Scotland into 6976 neighbourhoods and scoring each area against 38 indicators of deprivation(24).

Between January and July 2019, GR searched the internet to identify which of the 941 practices on the ISD/SIMD list had their own website. Directory-style entries on websites such as 'NHS Inform' were not counted as independent GP websites. Practice websites hosted by their local health board were included. Where practices had merged with others and now had a single group practice website, the data were collected under the code of the practice whose physical site they now shared, and no data were collected for the relocated practice.

Data were extracted from webpages that were likely to be frequently visited:

- Home –introductory page when clicking from a search result
- Appointments – how to make an appointment with a doctor
- Clinics and services – description of the clinics or extra services offered
- Repeat prescriptions – how to order repeat medicines
- New patient information – how to register.

Our primary measures of text readability were the Flesch-Kincaid Grade Level (FKGL) and Flesch Reading Ease (FRE) scores. These are well-established tools, and proxies for gold-standard comprehension tests(18). They consider average sentence length and syllables per word(19). Both FKGL and FRE are widely used and freely available within word-processing software(19). Both formulae have correlation coefficients >0.9 with comprehension tests(20).

UK government website designers and literacy campaigners suggest that websites should be comprehensible by a 9 to 14 year-old(8, 25). Text should follow the principles of 'Plain English.' Text should use short everyday words, avoid jargon, and be written in the first person with an active rather than passive voice (22, 23). The readability statistic target for 'Plain English' is an FRE ≥60(22).

Six secondary measures were recorded, as per recommendations from a previous review of readability(1):

- Word count
- Character count
- Paragraph count
- Sentences per paragraph
- Words per sentence
- Characters per word.

GR checked each of the five webpages for all the GP websites. Where practices did not have a separate webpage but had another part of the website with relevant text, that text was extracted instead. Where possible, only the main area of webpage text ('body text') was extracted. Navigation, headers and footers were not assessed. 'Body text' was copied into Microsoft Word 2016. Formatting elements were discarded. Where there had been a bulleted or numbered list, periods were added to the end of each line. Without periods the software calculated the whole list as a single sentence. This was misleading as the purpose of a list was generally to improve readability. NC

checked the readability statistics for a random 10% of websites. This revealed 100% agreement, so GR extracted the remaining data.

With 'R' software (v3.6.2) we used linear regression to model SIMD rank for each practice against the FKGL score(26). We considered a 'clinically' significant change in readability score to be one 'grade level' i.e. one UK school year.

We also assessed design factors that contributed to readability and accessibility. Informed by NHS England's Information Standard, the UK government website's 'design system' and recommendations from the Plain English Campaign we created a 'design score' of desirable features (Box 1)(10, 11, 22). We assessed the appointments page (or equivalent section) as we thought that there would be appointments content on most websites and has relevance to new and current patients. We scored the webpage 'body' rather than the navigation, header or footer. A score out of eight was given where there were no images, and ten with images. To allow comparison of webpages with different top scores, we calculated a scaled design score where each score was divided by the maximum possible score for that webpage.

Typeface size was not investigated because it adjusts automatically based on individual settings making it difficult to reliably record.

GR scored each website's appointments page or section, and NC scored a random 10%. Discrepancies were discussed and PH reviewed those that could not be resolved.

We assessed whether design scores varied within and between website providers. 'R' software (v3.6.2) was used to calculate the scaled design scores, mean scaled score and standard deviation for each provider and the number of webpages that scored full marks(26). We also assessed whether there was a correlation by linear regression between the design score and FRE readability statistic.

We conducted sensitivity analyses for both the readability and scaled design score investigations by excluding webpages with fewer than 150 words.

Results

Table 1 details the websites and anonymised providers of GP practice websites. 813/941 practices had a functioning website. 122 practices did not have a website, and six practices had merged with other practices since the 2016 ISD list and their web address re-directed to their new joint practice website.

Reliability

A random 10% of the ISD list of 941 practices (95 websites), were independently scored. There were no discrepancies in readability scoring.

7 of 95 webpage design scores had discrepancies of a maximum of 1 point (Cohen's Kappa coefficient 0.98). These discrepancies were resolved by discussion.

Readability statistics

If all 813 functioning websites had five webpages with extractable data, there would have been 4065 potential webpages to analyse. Readability statistics were calculable for 94% (3823/4065) of possible webpages (Supplementary Table S1).

77.1% (2949/3823) of the webpages were above the recommended 9-14 year-old reading age for online content. 22.9% (874/3823) were at or below the recommended age range. Figure 1 presents the FKGL scores (converted from the score's native US grade to age equivalents) from all the practice websites plotted by webpage.

The FRE results were similar (Figure 2), where 80.5% (3077/3823) of webpages were below the recommended FRE ≥60 cut off for 'Plain English.'

There was no significant association between the webpage reading ages (FKGL converted to UK ages) and the practice population's level of multiple deprivation (SIMD quintile). Supplementary Figure S1 presents the frequency of webpages of different reading ages for each webpage type by SIMD group.

Secondary readability statistics are reported in Supplementary Table S2.

Design and combined scores

94% (764/813 practices) had an appointments section, allowing a scaled design score to be calculated. 6.7% (51/764) of these scored full marks for design and accessibility.

There was a spread of scaled design scores within each provider (Figure 3), but similar variation in mean scaled design scores between website providers (Supplementary Table S3).

Figure 3 presents the scaled design score for each appointment webpage by that webpage's readability (classified as 'hard' or 'easy' to read). It is presented by website provider responsible for ten or more websites.

There was no significant association between the design score and readability (FRE statistic), with a correlation of 0.004 and *P*-value from linear regression of *P*=0.93.

Sensitivity analysis

We excluded webpages with <150 words and repeated the analyses (Supplementary Figures S2-S5). This removed the most extreme outlying readability scores (e.g. 'Clinics and Services' in Figure 2), but the proportions of pages above the thresholds remained consistent. A slightly stronger correlation (0.04) was noted between the design score and FRE but remained non-significant (*P*=0.23). See Supplementary Tables S4 and S5 for further description of the remaining outliers.

Discussion

Summary

86% of GP practices in Scotland have a website, but 77% (2949/3823) of webpages are above the recommended target reading age of 9–14 years old(8, 25), and 80.5% (3077/3823) above the target for 'Plain English (27).' There was no evidence that practice websites were adapted to meet the likely literacy levels of the populations they serve.

Only 6.7% (51/764) of websites fully met accessibility and design recommendations(28), and all website providers had evidence of suboptimal design. A single provider with a limited number of website design templates dominated the market. However, the spread in design scores across providers may demonstrate that practices retain some control over the readability of their output. Surprisingly, there was no association between text readability and the design scores, highlighting that a clear-looking website is not necessarily readable.

Strengths and limitations

To our knowledge, this is the most comprehensive assessment of GP websites to date, and the first to analyse design factors. Variability in website production required judgement to decide which text should be analysed, but there was minimal variation in scoring between researchers.

The main limitation was the use of readability formulae. The Flesch scores were designed for an American context, and whilst they are reliable, other measures are arguably better adapted to healthcare (1, 29, 30). The Flesch formulae however are the only ones embedded within commonly available software and were therefore the only practical option for this study.

Readability formulae can be misled by low word counts and special characters(1). For example, telephone numbers score as single difficult words(1, 31, 32). As recommended, we were consistent in the formatting we permitted, and performed sensitivity analyses(1).

Formulae also ignore vocabulary and the added complexity of numerical information, so are a proxy for comprehensibility(15, 18, 31). The high volume of health-related language on GP websites may mean that the formulae underestimate the impact of poor health literacy. For example, 'gastric' and 'tummy' are two syllable words that score equally yet may be differently understood(1).

The ease of website navigation can be a barrier and we could not establish a robust method of assessment. It is possible that apparently readable websites may be difficult to use.

User testing would clarify the link between proxy scores and the real-world usability and comprehensibility of websites. Unfortunately, that process was beyond the scope of this study.

Finally, we did not have the capacity to investigate accessibility for non-English speakers.

Comparison with existing literature

GP website readability has been under researched. One small study assessed the readability of ten English GP practice websites. They reported that 'most' websites were 'fairly difficult' to understand with an FRE score of 50-60, suggesting that 54% of the population would fully understand the content(33).

Patient information leaflets (PILs) and online condition-specific information has been more widely studied. Poor readability is universally reported(34-38). In comparison to a UK study of PILs in GP practices using the same readability formulae, we found that a greater proportion of webpages (77%) were above the reading level of a 14-year-old than the equivalent PILs (37.4%). A similar proportion (23% here Vs 24.3% in PILs) were within the respective readability targets(17).

Implications for research and practice

Our data suggest most GP websites across Scotland do not meet the standards recommended by the NHS, government and literacy charities and importantly, may not be tailored to meet the likely literacy needs of their populations. It is possible that the hastened uptake of digital health due to the COVID-19 pandemic could exacerbate health inequalities, especially if literacy is not considered(39). In Scotland, a national template for practices to adapt is being considered. Whilst website design may improve, practices will need support to create accessible content. Pre-population with user-tested accessible text could help, or the development of an NHS 'style-guide' like that developed by 'gov.uk'(25).

Whilst awaiting national efforts, practices can take steps to improve the situation, and our simple ten-point design score (Box 1) could be used as a guide. Flesch readability scores are freely available, but readability can be improved by editing the website whilst asking: 'could a 9-year-old understand this?' Removing medical terms is critical.

Our assumption is that readability and design improvements promote comprehension and health literacy, but this can only be assessed by testing websites with their target users(14, 31, 40). Practices will require support and resources to enact such recommendations, but failure to do so may inadvertently widen health inequalities. In a time of scarce resources, partnerships between Patient Participation Groups, literacy charities, government and practices may be necessary to ensure digital changes are inclusive.

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Competing interests: Nil.

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Boxes, tables and figures

Box 1: Design score

Basic factors (1 point each)	
Use of sans serif typeface	Headings, main text and captions
Use of a single typeface	Headings, main text and captions
'Scannable' text	Use of features such as subheadings, bulleted lists or paragraph breaks to divide information
Bold	Used for emphasis only
No block capitals	
No italicised text	
Clear text and background colour contrast	
Optimised for smartphone browsers	The webpage must automatically detect it is being viewed on a smartphone screen and adjust to the screen ratio so that it is usable
Additional items if images present (1 point each)	
Captioned illustrations	All images should be captioned
'ALT' text on illustrations	A meaningful description of the image that screen reading software can read aloud to aid partially sighted users

Table 1: Practice websites & website providers

Characteristic	**Number of practices**	**% total practices n=941**	**% total with websites n=813**
Total practices on ISD 2016 list	941		
Practices that had merged their websites with those of other practices	6	0.6	
Practices without a website	122	12.9	
Total number of unique practice websites	813	86.4	
Total number of practices with an appointment page or section to allow calculation of the 'design score'	764	81.2	94.0
Website provider anonymised and listed individually if ≥10 websites provided	**Number of practices**	**% total practices n=941**	**% total with websites n=813**
A	33	3.5	4.1
B	65	6.9	8.0
C	19	2.0	2.3
D	417	44.3	51.3
E	35	3.7	4.3
F	32	3.4	3.9
G	13	1.4	1.6
H	11	1.2	1.4
I	50	5.3	6.2
Designed by the practice ('designed in-house')	80	8.5	9.8
Miscellaneous - designed by a web company providing <10 websites	58	6.2	7.1

Figure 1: FKGL by website page

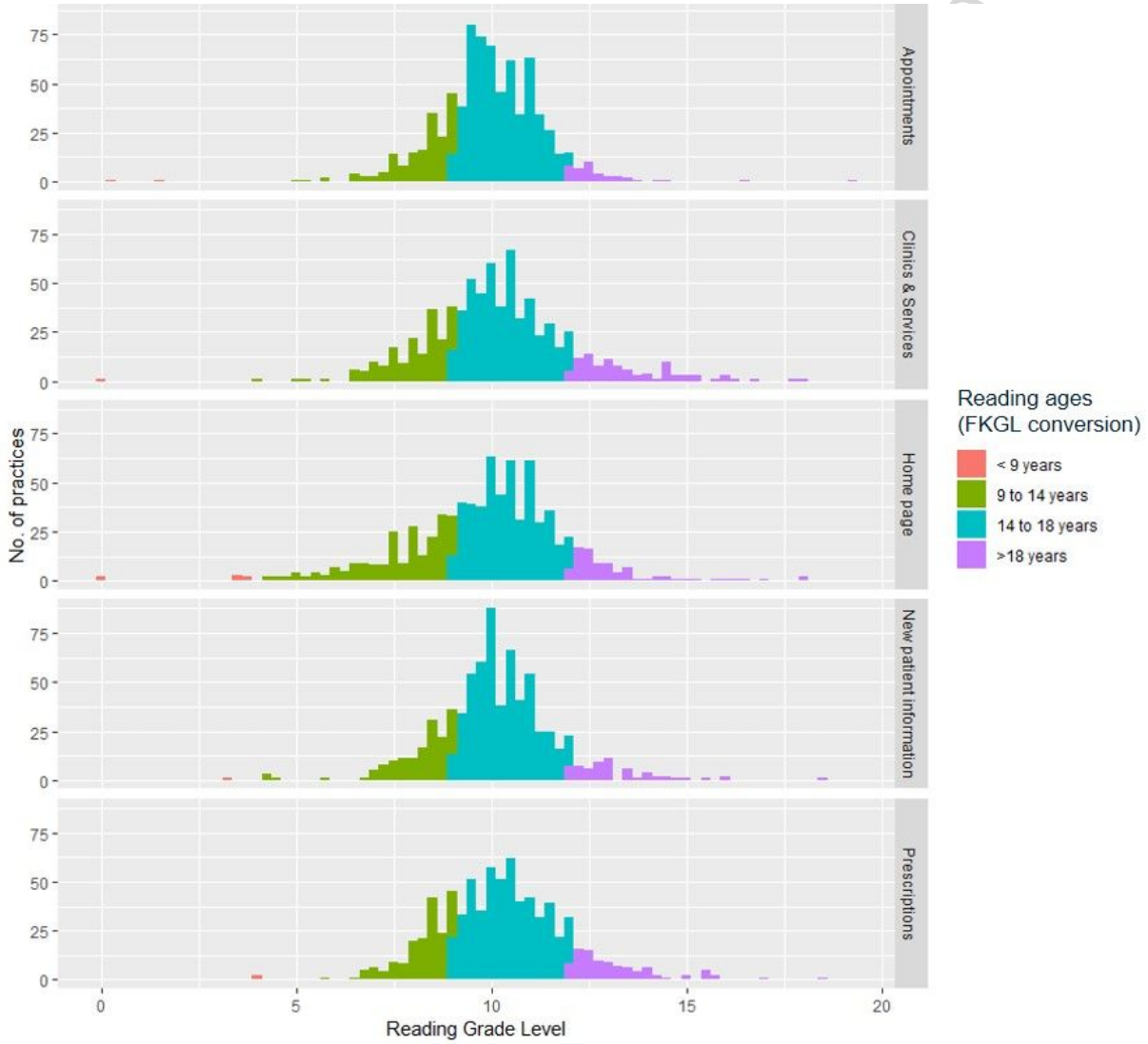
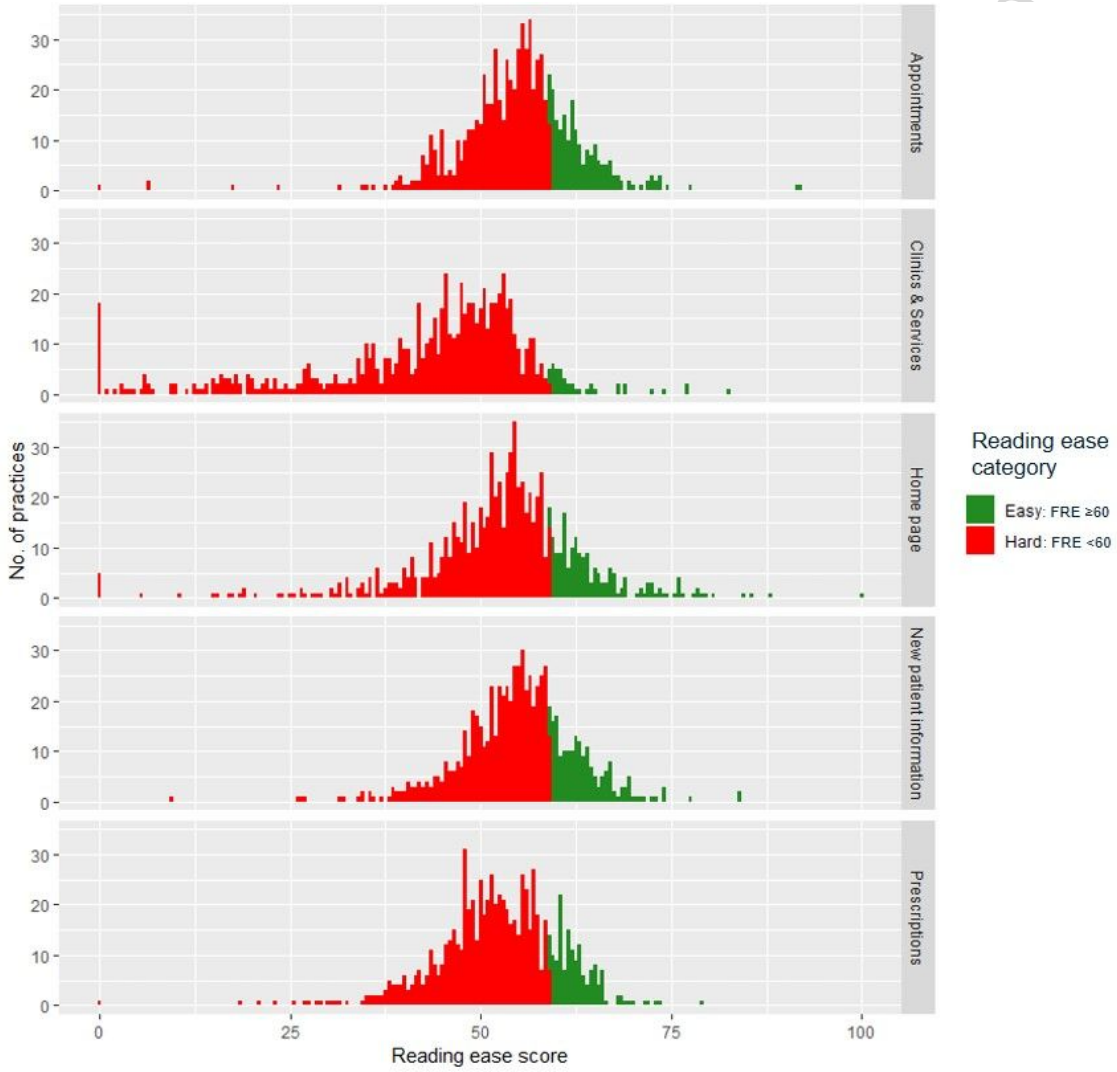
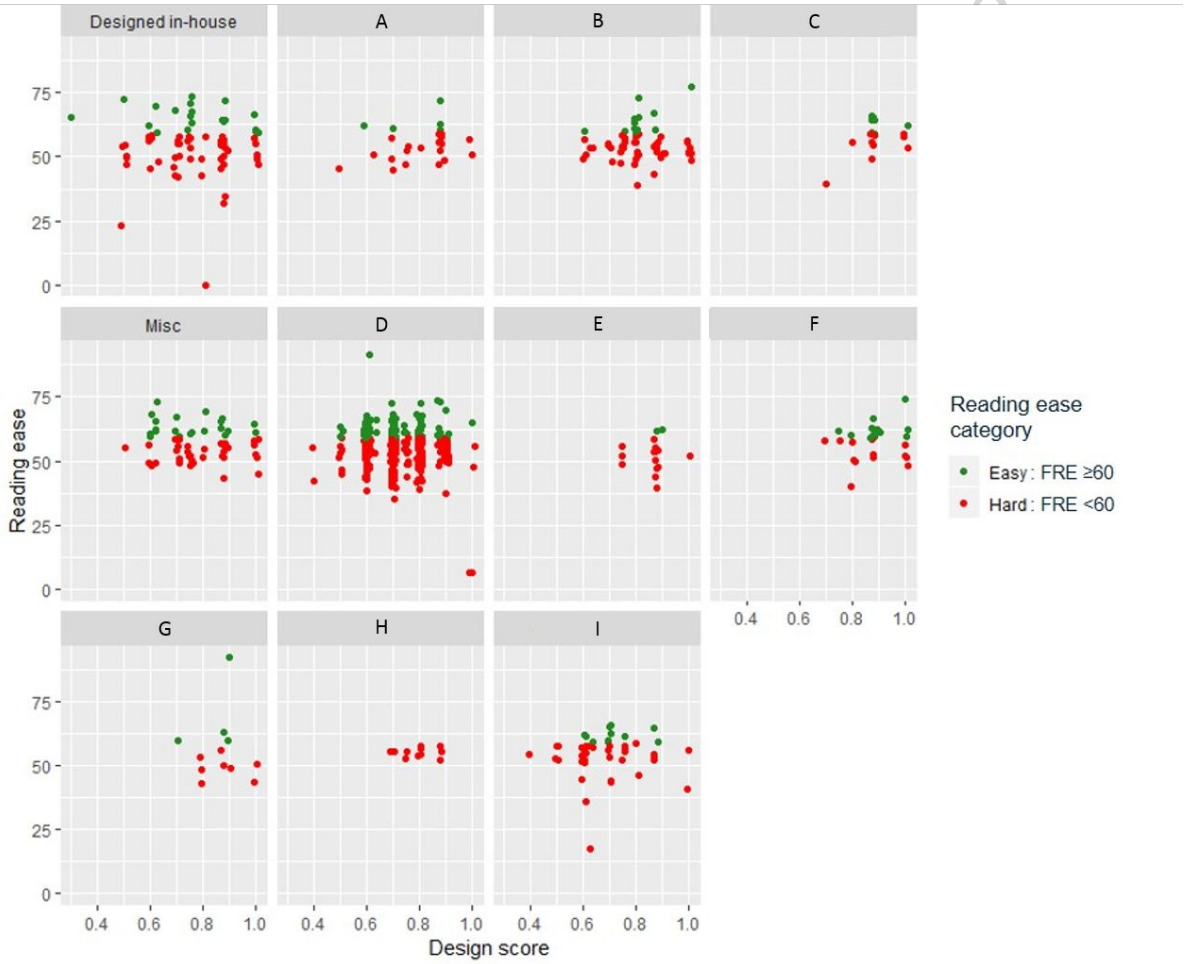


Figure 2: FRE by website page



Note: The outlying peaks at 'FRE = 0' in 'Clinics and Services' and 'Home Page' were removed when pages with <150 words were excluded but the overall proportions above the FRE threshold remained consistent – see Sensitivity Analysis and Supplementary Figure S3.

Figure 3: Combined readability (FRE reading ease) and scaled design scores by website provider (anonymised: A-I, 'Designed in-house' and 'Misc.')



Note: The 'Misc.' group are websites designed by commercial providers who provided fewer than ten websites.

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