

SCIENTIFIC
SECTION

How readable are orthodontic patient information leaflets?

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Objective: To assess the readability of published orthodontic patient information leaflets (PILs) and their eligibility for the Plain English Campaign's Crystal Mark.

Design: A retrospective, observational study.

Setting: PILs available from professional organizations and commercial companies.

Materials and methods: Twenty-six orthodontic PILs were assessed. The entire text of each leaflet was reproduced in Microsoft Word, 2000. Readability statistics were obtained via the 'Tools' menu. The design elements of each leaflet were assessed. The leaflets were sent to the Plain English Campaign for assessment of their eligibility for the Crystal Mark.

Outcome measures: Leaflet and sentence length, passive percentage, Flesch Reading Ease score, Flesch Kincaid Grade Level, design percentage and eligibility for the Plain English Campaign's Crystal Mark.

Results: Overall, nearly half of the leaflets (42.3%) were rated as 'fairly difficult' or 'difficult' to read. However, the BOS PILs were significantly better than the AAO leaflets in all but one outcome with the BOS leaflets being rated as 'standard' or 'fairly easy' to read, meaning that 70–80% of the UK population would be able to understand them. None of the PILs were eligible for the Plain English Campaign's Crystal Mark.

Conclusions: The orthodontic PILs assessed were difficult to read and none were eligible for the Plain English Campaign's Crystal Mark. However, the BOS leaflets were much easier to read and better designed than those produced by the AAO making them a useful tool to improve patients' understanding of different treatment options and allowing them to be used in the informed consent process.

Key words: Readability, orthodontic, patient information leaflets (PILs), Crystal Mark

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Introduction

Communication is a key process in health care provision. It not only provides the foundation for diagnosis and treatment, but is also closely associated with therapeutic outcomes.¹ Patients can be left feeling unhappy with the amount of information they receive and the information that is given is often misunderstood or forgotten.²

Evidence suggests that a patient's overall satisfaction with a clinician is increased if s/he is given, and understands, information and clinical advice.³ Nanda and Kierl⁴ highlighted this by stating that successful orthodontic treatment depended not only on the knowledge and skills of the clinician, but also on the co-operation of the patient and parents. A high proportion of parents of children undergoing orthodontic treatment, have been found to be unaware of its potential negative outcomes e.g. relapse and caries.⁵

Patients tend to forget or misunderstand much of what is discussed during a consultation.⁶ In general, people only retain about 20% of what they hear, but this may increase by up to 50% if there is additional visual or written input.⁷ George *et al.*⁸ demonstrated that patients favoured written information and that patients who were given leaflets were more satisfied with their treatment as a whole.

Leaflets are cheap to produce and can save patients the embarrassment of asking questions directly of a professional.⁹ They can be used to reinforce what has been discussed¹⁰ and can be referred to by patients away from the stressful environment of the consultation room.¹¹ Weinman¹² confirms the desire, use and value of leaflets by patients, showing that 75% of patients wanted written information and that 80% read the leaflets. Disappointingly though, the design of health information leaflets is poor.^{13,14}

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In the interaction of the 2 elements, the design elements enhance the readability of the primary structural elements.^{15,16,17} Outside factors, such as stress, may also influence patients learning.¹⁸

Readability formulae assess the structural elements of the text and are designed to measure the reading difficulty. There are over 50 published readability formulae³ that produce a score or number that indicates how readable that piece of text is. Most are based on the premise that long words and/or sentences make text harder to understand.¹⁹

The reading abilities vary widely across the population so it is important that information is pitched at a suitable level for it to be understood by the maximum number of patients.²⁰ The Adult Literacy and Basic Skills Unit²¹ found 1 in 5 of the UK population is functionally illiterate. In the USA, the average reading level is 8th grade (around 14 years of age), with 1 in 5 adults reading at the 5th grade level (around 11 years old) or below.²² Many researchers have found that PILs and information on web pages tend to be written at too high a level for the general public.^{20,23–27} However, despite an improvement in the readability of leaflets recently, the aim of having them written at the level of 6th grade (around 12 years old) has not yet been achieved.²⁸

No assessment of the readability of orthodontic PILs has been conducted; therefore, this study was designed to address this issue.

Aims

The aim of this study was to assess the readability of published orthodontic patient information leaflets and their eligibility for the Plain English Campaign's Crystal Mark.

Objectives

The objectives of this study were to:

- assess the readability of 26 published orthodontic PILs using the Flesch Reading Ease and Flesch–Kincaid Grade Level tests;²⁹
- compare the assessed readability of each leaflet with the percentage of the UK population who would understand it;
- test for difference in readability between the leaflets published by the American Association of Orthodontists (AAO) and British Orthodontic Society (BOS);
- carry out the 'sentence length' and 'passive percentage' tests on each leaflet and compare the results with recommended levels;

- assess the design elements of each leaflet;
- determine the best and worst performing leaflets overall;
- establish which leaflets would be eligible for the Plain English Campaign's Crystal Mark.³⁰

Methods

Twenty-six orthodontic PILs were obtained from professional organizations and commercial companies (*see* Table 1).

To ensure that the analysis of the text was reliable the entire text of each leaflet was typed into a word processing program (Microsoft Word, 2000) because the analysis of the complete text is more reliable than working with samples of text.³¹

Reading statistics

The following reading statistics for each leaflet were obtained via the Tools menu:

- Flesch Reading Ease score (*see* Appendix 1);
- Flesch-Kincaid Grade level, (*see* Appendix 1);
- mean number of words per sentence (sentence length);
- number of passive sentences then expressed as a percentage of the whole text;
- total number of words;
- mean number of words per sentence.

Design elements

The design elements of each leaflet were assessed using a 20-item checklist compiled from guidelines from Coey,³¹ the National Institute for the Blind³² and the Centre for Health Information Quality.³³ Each leaflet was given a percentage score (design percentage) expressing the number of criteria that were satisfied (*see* Appendix 2). A record was also made of the number of leaflets satisfying each criterion.

Plain English Campaign Crystal Mark

The leaflets were sent to the Plain English Campaign (www.plainenglish.co.uk/crystalmark.html) for assessment of their eligibility for the Crystal Mark. The initial assessment was free and included looked for:

- a good average sentence length (about 15–20 words);
- plenty of 'active' verbs (instead of 'passive' ones);
- everyday English;
- words like 'we' and 'you' instead of 'the insured', 'the applicant', 'the society' and so on;
- conciseness;

Table 1 Title of leaflet, publishing organization, publication date and identification code (ID) used in this study

Title	Organization	Publication date	Identification code (ID)
1. All about orthodontics: braces, faces and more	American Association of Orthodontists (AAO)	2001	AAO 1
2. Looking good, feeling good: the personal benefits of orthodontics	AAO	2001	AAO 2
3. Your child's first orthodontic check-up: no later than age 7	AAO	2001	AAO 3
4. Adult orthodontics: a healthy, beautiful smile at any age	AAO	2001	AAO 4
5. Orthodontics and surgery: when treatment calls for a specialized partnership	AAO	2001	AAO 5
6. The importance of clean teeth: good oral hygiene during orthodontic treatment	AAO	2001	AAO 6
7. Elastics: they're pulling for you	AAO	2001	AAO 7
8. Orthodontic headgear: getting into gear	AAO	2001	AAO 8
9. Retainers: helping keep things straight	AAO	2001	AAO 9
10. Orthodontic treatment	British Orthodontic Society (BOS)	Not dated	BOS 1
11. Your first visit to the orthodontist	BOS	Not dated	BOS 2
12. Adult orthodontics	BOS	Not dated	BOS 3
13. Orthognathic surgery	BOS	Not dated	BOS 4
14. Removable appliances	BOS	Not dated	BOS 5
15. Functional appliances	BOS	Not dated	BOS 6
16. Fixed appliances	BOS	Not dated	BOS 7
17. Headgear	BOS	Not dated	BOS 8
18. Retainers	BOS	Not dated	BOS 9
19. Orthodontic treatment for children	Australian Society of Orthodontics (ASO)	Not dated	ASO 1
20. Orthodontic treatment for adults	ASO	Not dated	ASO 2
21. Why bother to clean your teeth?	Cybersign Ltd. (CS)	2001	CS 1
22. Removable appliances	CS	2001	CS 2
23. Functional appliances	CS	2001	CS 3
24. Fixed appliances	CS	2001	CS 4
25. Oral care and braces	Oral B (OB)	Not dated	OB
26. Caring for your teeth and fixed appliance	Stafford Miller (SM)	Not dated	SM

- clear, helpful headings with consistent and suitable ways of making them stand out from the text;
- a good type size and clear typeface;
- a reasonably short average line length;
- plenty of answer space and a logical flow (on forms).

Statistical analysis

The mean score and standard deviation, of each leaflet, for each reading statistic were calculated. The weighted mean difference (WMD), with associated 95% confidence intervals (95% CI) and *p* values, were used to assess differences in the mean scores of the AAO and BOS leaflets. The scores for each group of leaflets (by publisher) were ranked for each test. The overall score of each group of leaflets was then ranked to give the best and worst performing leaflets.

Results

The title of each leaflet evaluated, along with its publishing organization, publication date and the identification code are shown in Table 1. Only half (13/26, 50%) of the leaflets had a publication date printed on them. The mean and standard deviations for each test, by leaflet group, are shown in Table 2.

There were insufficient numbers of PILs from each source to allow direct statistical comparison of PILs numbers 19–26. The results therefore concentrate on a comparison of the AAO and BOS PILs (*see* Table 3).

Leaflet length

The PILs examined in this study showed a wide range of the number of words in the whole leaflet from 356 to 2020. The mean total number of words for all the PILs was 912.7 (SD=472.5). There was a highly statistically

Table 2 Mean and (standard deviations) for each group of leaflets by test result

PILs	Number of leaflets	Total number of words	Number of words in sentence	Passive voice percentage	FRE	FKGL	Design percentage
AAO	9	1449.3 (359.9)	15.9 (0.5)	5.9 (4.7)	43.9 (5.2)	10.9 (0.7)	76.7 (2.5)
BOS	9	648.3 (107.8)	12.9 (0.4)	19.7 (4.1)	70.8 (4.6)	6.6 (0.7)	80.0 (0.0)
ASO	2	663.5 (60.1)	14.2 (0.6)	18.0 (5.7)	49.2 (1.2)	9.9 (0.4)	80.0 (0.0)
CS	4	473.8 (86.8)	13.0 (1.0)	15.3 (11.3)	67.3 (7.7)	7.0 (1.0)	82.5 (5.0)
OB	1	1196*	15.3*	3*	69.2*	7.3*	90.0*
SM	1	434*	16.3*	3*	62.5*	8.5*	80.0*
All	26	912.7 (472.5)	14.3 (1.5)	12.8 (8.6)	58.9 (13.3)	8.5 (2.1)	79.6 (3.7)

*Indicates actual score as only one PIL in each group.

Table 3 Comparison of the leaflets produced by the AAO and BOS

	AAO	BOS	Weighted mean difference (WMD)	95% CI	p value	Favours
Number of leaflets	9	9				
Mean total number of words (SD)	1449.3 (359.9)	648.3 (107.8)	801.00	555.6, 1046.44	0.00001	BOS
Mean number of words in sentence (SD)	15.9 (0.5)	12.9 (0.4)	2.93	2.50, 3.36	0.00001	BOS
Passive voice % (SD)	5.9 (4.7)	19.7 (4.1)	-16.78	-20.83, -12.73	0.00001	AAO
Mean FRE score (SD)	43.9 (5.2)	70.8 (4.6)	26.88	22.31, 31.45	0.00001	BOS
Mean FKGL score (SD)	10.9 (0.7)	6.6 (0.7)	4.31	3.65, 4.97	0.00001	BOS
Design percentage	76.7 (2.5)	80.0 (0.0)	-3.30	-4.93, -1.67	0.00007	BOS

significant difference ($p=0.00001$) between the mean number of words in the AAO and BOS leaflets, with the AAO leaflets being longer [weighted mean difference, WMD (95% CI)=801 (555.6, 1046.44)].

Sentence length

The mean number of words per sentence for all leaflets was 14.3 (SD=1.5). Again, there was a highly statistically significant difference ($p<0.00001$) between the mean number of words per sentence in the AAO and BOS leaflets, with the AAO leaflets having more words per sentence [WMD (95% CI)=2.93 (2.50, 3.36)].

All of the leaflets examined fell within the range of the sentence length recommended by the Plain English

Campaign, i.e. 15–20 words. However, the PILs from the BOS rank best with the shortest sentences above the AAO leaflets, which were ranked in 5th place (see Table 4). The worst performing leaflet was that from Stafford Miller.

Passive percentage

The mean passive percentage score for all leaflets was 12.8 (SD=8.6). There was a highly statistically significant difference ($p=0.00001$) between the mean passive percentage scores of the AAO and BOS leaflets, with the BOS leaflets having a higher passive percentage [WMD (95% CI)=-16.78 (-20.83, -12.73)] suggesting that they were harder to read.

Table 4 Leaflet ranking according to each test

Leaflet	Words per sentence	Passive percentage	FRE	FKGL	Design percentage	Total	Overall
OB	4	1.5	2	3	1	11.5	1
CS	2	4	3	2	2	13	2.5
BOS	1	6	1	1	4	13	2.5
SM	6	1.5	4	4	4	19.5	4
ASO	3	5	5	5	4	22	5
AAO	5	3	6	6	5	25	6

This was the only test where PILs from the AAO performed better than those from the BOS. All leaflets were rated as 'excellent' or 'good' in terms of clarity (see Appendix 2). The two best leaflets were commercial publications from Oral B and Stafford Miller. The worst performing leaflets on this test were those from the BOS.

Flesch Reading Ease (FRE)

The mean FRE score for all leaflets was 58.9 (SD=13.3). There was a highly statistically significant difference ($p<0.00001$) between the mean FRE scores of the AAO and BOS leaflets, with the BOS leaflets having a higher score [WMD (95% CI)=26.88 (22.31, 31.45)], suggesting that they are easier to read.

Flesch Kincaid Grade Level (FKGL)

The mean FKGL for all leaflets was 8.5 (SD=2.1). There was a statistically significant difference ($p=0.00001$) between the mean FKGL of the AAO and BOS leaflets, with the BOS leaflets having a lower FKGL [WMD

(95% CI)=4.31 (3.65, 4.97)], again suggesting that the BOS leaflets are easier to read.

Reading difficulty

Overall, the leaflets ranged from being 'fairly easy' to 'fairly difficult' to read, with just half of them being 'fairly difficult' or 'difficult' to read, meaning that less than 40% of the UK population would understand them (Table 5a,b).

All the AAO leaflets were 'fairly difficult' or 'difficult' to read, whereas all the leaflets produced by the BOS were 'standard' or 'fairly easy' to read meaning that 70–80% of the populations would be able to read them (Table 5a).

Design percentage

All leaflets scored highly on the design element checklist, but only half (10/20) of the criteria were satisfied by all leaflets (Table 6). The 3 criteria that were least frequently satisfied were:

- using a sans serif type face,
- indenting the first line of each paragraph;
- not interrupting the flow of the text with pictures.

Again, there was a statistically significant difference between PILs from the AAO and BOS with the leaflets from the BOS having a better design [WMD -3.30 (95% CI $-4.93, -1.67$)]. The leaflets from the BOS were in a triple-folded A4 format, whereas those from the AAO were small booklets of similar size that were not written or designed to be browsed through.

Plain English Campaign's Crystal Mark

Feedback from the Plain English Campaign revealed that none of the 26 PILs were eligible for the Crystal Mark.

Table 5 (a) The reading difficulty and percentage of the UK population who would be able to understand them

Leaflet	Reading difficulty	Percentage UK population able to understand them
AAO:1	Difficult	24
AAO:2	Difficult	24
AAO:3	Difficult	24
AAO:4	Difficult	24
AAO:5	Difficult	24
AAO:6	Fairly difficult	40
AAO:7	Difficult	24
AAO:8	Difficult	24
AAO:9	Difficult	24
BOS:1	Standard	70
BOS:2	Standard	70
BOS:3	Standard	70
BOS:4	Standard	70
BOS:5	Fairly easy	80
BOS:6	Fairly easy	80
BOS:7	Fairly easy	80
BOS:8	Standard	70
BOS:9	Fairly easy	80
ASO:1	Fairly difficult	40
ASO:2	Fairly difficult	40
CS:1	Fairly easy	80
CS:2	Standard	70
CS:3	Standard	70
CS:4	Standard	70
OB	Standard	70
SM	Standard	70

Table 5 (b) Percentage of leaflets at each level of reading difficulty

Reading difficulty	Percentage of leaflets (%)	Percentage of UK population able to read the leaflets (%)
Difficult	30.8	24
Fairly difficult	11.5	40
Standard	38.5	70
Fairly easy	19.2	80
Total	100.0	

Overall findings

There were significant differences between the PILs published by the AAO and BOS in all assessments made. The BOS PILs were easier to read and better designed than those produced by the AAO and outperformed them in all but one assessment i.e. the passive percentage test. PILs from the BOS were ranked in joint second place overall (with Cyber Sign) above those from the AAO that were ranked in sixth place.

Discussion

Implications of results

Nearly all of the leaflets (42.3%) were rated as 'fairly difficult' or 'difficult'. This means that an IQ of 104+ would be required to understand many of the leaflets and that only 24–40% of the UK population would be able read them. This suggests that the majority of orthodontic PILs examined were written at too high a level to be understood by the average patient. However, all the BOS leaflets were rated as 'standard' or 'fairly

easy' to read meaning that 70–80% of the UK population would be able to understand them.

The length of the leaflets varied considerably. Although length, *per se*, does not affect reading ease the longer leaflets may be off-putting, meaning that fewer patients and/or parents would read them. This would then make them less effective as an information tool.

Limitations of study methods

Readability formulae should only be used as a guide for assessing reading difficulty of a text³⁴ as they do not take into account other factors that can influence the comprehension of a text, e.g. the use of active and passive verbs, the way the information is organized and looks on the page, and the reader's motivation and level of prior knowledge.³⁵ Blinkhorn and Verity³⁶ pointed out that dentistry has evolved a professional vocabulary that may be incomprehensible to the layman and that readability formulae may therefore under-estimate the difficulty of a text. Interestingly, they found that all 14 year olds studied could pronounce and understand the word 'orthodontics', but only 14% knew the meaning of the word 'appliance', which was used widely in the 26 PILs examined in this study. The term 'brace' could easily be substituted and may be more easily understood.

The rejection of all 26 PILs by the Plain English Campaign highlights the problem with readability tests in that they do not guarantee the readability of a leaflet.

Comparison with other studies

Our study shows that a similarly high percentage of the AAO PILs were written at too high a level compared with other studies but that the BOS leaflets were far more readable than most PILs (*see* Table 7). Interestingly, despite the need for specialized language, the BOS PILs were easier to read than general dental practice leaflets in the UK²⁴ and websites seem to be written at a level that is easier to read than PILs.²⁰ One of the design criteria assessed was the Royal National Institute for the

Table 6 Number and percentage of leaflets satisfying each design criteria

Design criteria	Number	Percentage (%)
Minimum 12-point font	15	58
Sans serif typeface	5	19*
One typeface only	26	100
Arabic numerals only	26	100
Indented 1st line of paragraph	4	15*
Unjustified right margin	26	100
Bold only for emphasis	26	100
No underlining	16	62
No full uppercase words	26	100
No italics for long passages	16	62
Question headings	16	62
Headings in different type	26	100
Lines of type clearly spaced	26	100
Unrelated sections clearly separated	22	85
Information summarized +/- bullet points	23	88
Text flow not interrupted by pictures	9	35*
Contrast between paper and text	26	100
Paper not high gloss	26	100
Use of illustrations	26	100
Appealing use of colour	17	65

*Less than 50%.

Table 7 Comparison with other studies

Specialty	Reading level
Periodontics ²³	85% above 7th grade
SLE37	89% above 9th grade
Pediatrics ³⁸	98% above 7th grade
Palliative care	64% at or above 9th grade
General dental practice ²⁴	88% at or above 7th grade
AAO	100% above 7th grade
BOS	44% above 7th grade

Blind's recommended 12-point minimum font size,³² which was satisfied by all of the BOS PILs compared with only 10.6% of medical practice leaflets assessed in a similar study.¹³

Implications for practice

It is recommended that verbal information given to patients should always be supported by written and/or visual information.³⁹ Although PILs have been shown to be effective in increasing knowledge,⁴⁰ they need to be written at a suitable level to be understood. Studies suggest that highly educated patients do not mind if instructional materials are oversimplified for them.⁴¹ Offering patients leaflets, as an adjunct to a consultation, may even be seen as a sign of respect and caring, regardless of whether patients actually read them or not.⁴²

Patients must understand what that treatment involves, the alternatives available, and the risks and benefits of various treatment options when giving informed consent to treatment. Leaflets can only help give patients information if they are readable and understandable. Using patients and the public in lay reader panels can greatly assist in the production of readable PILs that are suited to their users.

Errors in communication can prompt allegations of malpractice.²⁴ It is therefore necessary to document which PILs have been given to patients during the consent process in order to help reduce misunderstandings between the patient and clinician. Sections for this are now included in some consent forms.^{43,44}

The accessibility of information is an important consideration in modern-day practice. Under the Disability Discrimination Act (1995),⁴⁵ orthodontists could be prosecuted for not providing information in other accessible formats, for example, Braille, computer disc or audiotape. Thought must also be given to patients whose first language is not English, so PILs need to be available in other languages to ensure that patients are able to give their informed consent.

Implications for research

The move towards evidenced-based dentistry requires that there is sound evidence of the efficacy of the interventions we provide for our patients. It is important, therefore, to be able to demonstrate knowledge gain from PILs to be able to justify their use. This can be done in an appropriately designed, randomized, controlled trial. From the standpoint of clinical governance, the design of leaflets needs to be evidence-based and

peer reviewed. The quality of the information in the PILs was not assessed in this study, but may be an important consideration for future research.

Conclusions

- Overall, the orthodontic PILs assessed were difficult to read. However, the BOS leaflets were much easier to read and better designed than those produced by the AAO.
- The mean readability of all PILs was rated as 'fairly difficult', meaning that only 40% of the UK population would be expected to understand them. Nevertheless, all the BOS leaflets were rated as 'standard' or 'fairly easy' to read, meaning that 70–80% of the UK population would be able to understand them.
- There were significant differences between PILs from the AAO and BOS on all tests. The BOS leaflets were significantly better on all tests except the passive percentage test.
- None of the leaflets assessed were eligible for the Plain English Campaign's Crystal Mark.

The use of the Crystal Mark to clearly denote readable PILs is recommended.

Contributors

A. Harwood contributed to the writing of the protocol; was responsible for material and data collection, data analysis and interpretation and the drafting, and final approval of the article. J. E. Harrison was responsible for the conception and design of the study; contributed to the writing of the protocol; assisted in data analysis and interpretation, and was responsible for critical revision and final approval of the article. Jayne Harrison is the guarantor.

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Appendices

These are available only on the web version of this page (<http://jorthod.maneyjournals.org/>).

Appendix 1: Explanation of the assessment criteria used to assess the leaflets

Flesch Reading Ease (FRE)

The FRE score ranges from 0 to 100, where a text with a lower score is harder to read than one with a higher score. It uses sentence length and polysyllabic words to determine difficulty. A score of 0 would be practically unreadable and a score of 100 would be easy to read for any literate person.

Flesch Kincaid Grade Level (FKGL)

The FKGL gives a result in terms of United States (US) school grades. It uses mean sentence and word length to determine the readability level.

Table A1 compares the interpretation of the FRE and FKGL scores.

US school grade reading age

To make sense of the US school grade system in terms of reading age it has been suggested that one adds 6 to the grade level. For example, a child in the 6th grade in the US is about 12 years old.³¹

Sentence length

The sentence length test is simply the total number of words in a document divided by the total number of sentences to give an average sentence length. An average sentence length of between 15 and 20 words is ideal according to the Plain English Campaign.

Passive percentage

Passive verbs cause several problems as they:

- can be confusing;
- often make writing more long-winded;
- make writing less lively.

With an **active** verb, the 3 parts of a sentence appear in the order: **subject** then **verb** then **object**. For example:

Anne (**subject**) read (**verb**) the leaflets (**object**).
‘Read’ is an active verb here. The sentence says who is doing the reading before it says what is being read.

With a passive verb, the order is reversed: **object** then **verb** then **subject**.

The leaflet (**object**) was read (**verb**) by Anne (**subject**).

‘Read’ is a passive verb here. The sentence says what is being read before it says who is doing the reading.

By making the sentence passive, the words ‘was’ and ‘by’ were introduced making the sentence clumsier. You should aim to make 80–90% of verbs active.

To derive the passive percentage the number of passive verbs in a document is divided by the total number of sentences and multiplying the result by 100. See Table A2.

Table A2 Interpretation of passive percentage score in terms of clarity level (plain English Campaign)

Passive percentage	Clarity level
0–25	Excellent
26–50	Good
51–75	Average
76–99	Poor
100	Bad

Table A1 A comparison of FRE and FKGL scores with reading difficulty, IQ, percentage of the UK population who would be expected to understand the text and an example of the type of publication written at this level^{24,31}

FRE	FKGL	Difficulty	IQ required	% UK population who understand	Example
91–100	4	Very easy	81+	90	<i>The Sun</i>
81–90	5	Easy	84+	86	<i>Time magazine</i>
71–80	6	Fairly easy	87+	80	<i>The Daily Mail</i>
61–70	7–8	Standard	90+	70	<i>Reader’s Digest</i>
51–60	9–10	Fairly difficult	104+	40	Quality magazines
31–50	11–14	Difficult	111+	24	<i>The Times</i>
0–30	15–16	Very difficult	126+	4.5	<i>British Dental Journal</i>

Appendix 2: Design percentage checklist

The design percentage checklist was compiled from guidelines from the RNIB,³² CHIQ³³ and Coey.³¹ and is shown below.

Design element checklist

- | | | | |
|----------------------------------|--------------------------|---|--------------------------|
| Minimum 12-point font | <input type="checkbox"/> | Bold only for emphasis | <input type="checkbox"/> |
| Simple (sans serif) typeface | <input type="checkbox"/> | No underlining | <input type="checkbox"/> |
| Only one typeface | <input type="checkbox"/> | No full uppercase words | <input type="checkbox"/> |
| Arabic versus roman numerals | <input type="checkbox"/> | No italics for long passages | <input type="checkbox"/> |
| Indented first line of paragraph | <input type="checkbox"/> | Use of question headings | <input type="checkbox"/> |
| Unjustified right hand margin | <input type="checkbox"/> | Headings in different type | <input type="checkbox"/> |
| | | Lines of type clearly spaced | <input type="checkbox"/> |
| | | Unrelated sections clearly separated | <input type="checkbox"/> |
| | | Information summarized +/- bullet points | <input type="checkbox"/> |
| | | Sentence flow not interrupted by pictures | <input type="checkbox"/> |
| | | Contrast between paper and text | <input type="checkbox"/> |
| | | Paper not high gloss | <input type="checkbox"/> |
| | | Use of illustrations | <input type="checkbox"/> |
| | | Appealing use of colour | <input type="checkbox"/> |