**Title: Accessibility of online self-management support websites for people with osteoarthritis: A text content analysis**

**Authors: Lara Chapman, Charlotte Brooks, Jem Lawson, Cynthia Russell and Jo Adams**

**Journal: Chronic Illness**

**Abstract**

**Objectives:** This study assessed accessibility of online self-management support webpages for people with osteoarthritis by considering readability of text and inclusion of images and videos.

**Methods:** Eight key search terms developed and agreed with patient and public involvement representatives were entered into the Google search engine. Webpages from the first page of Google search results were identified. Readability of webpage text was assessed using two standardized readability indexes, and the number of images and videos included on each webpage was recorded.

**Results:** Forty-nine webpages met the inclusion criteria and were assessed. Only five of the webpages met the recommended reading level for health education literature. Almost half (44.9%) of webpages did not include any informative images to support written information. A minority of the webpages (6.12%) included relevant videos.

**Discussion:** Information provided on health webpages aiming to support patients to self-manage osteoarthritis may not be read, understood or used effectively by many people accessing it. Recommendations include using accessible language in health information, supplementing written information with visual resources and reviewing content and readability in collaboration with patient and public involvement representatives.

**Keywords:** Osteoarthritis, self-management, readability, websites, literacy.

**Introduction**

Osteoarthritis (OA) is a prevalent musculoskeletal condition affecting approximately 10-15% of all adults over the age of 60 [1]. Chronic joint pain is a common, debilitating symptom of the condition often resulting in disability and work-related sickness, negatively impacting upon the independence and quality of life of the individual [2, 3]. It is therefore unsurprising that OA is associated with significant economic implications; in 2013 the NHS musculoskeletal health budget cost £5.34 billion [4].

Public health reports and recommendations emphasise the need for increased self-management for patients with chronic conditions, including OA [5, 6]. Self-management involves the day-to-day actions taken, decisions made and behaviours engaged in by people with chronic illness in order to manage their own health [7]. The process of tissue repair in the pathophysiology of OA can be actively helped by self-management strategies, such as exercise [8] and weight management [9]. Activity pacing [10] and footwear changes [11] can also be effective in relieving symptoms of pain and fatigue associated with the condition. National guidelines for patients with OA emphasise targeting self-management strategies relating to behavioural changes, and state that a person’s understanding of their condition and its management should be enhanced by provision of accurate verbal and written information [6].

One method of providing accessible information and support that informs self-management educational approaches is via the internet, on webpages (single online documents) and websites (a collection of webpages). The growth of the digital age has led to an increase in the number of websites aiming to provide health information to people living with chronic conditions. Online health information may be accessed independently by patients seeking information about a condition, and healthcare professionals may signpost patients to trusted websites. The number of people accessing health information from the internet continues to rapidly increase; for example, 90% of households in Great Britain currently have access to the internet, increasing from 57% in 2006, and 49% of UK internet users accessed health-related information online in 2016 [12]. Internet use is particularly increasing among older adults; in the United States (US), 64% of adults over the age of 65 are now internet users, compared to 32% of this age group in 2006 [13]. Online health information can support healthcare professionals in engaging people to take up self-management strategies, and this has been shown to be cost-effective in the management of chronic conditions [14]. However, the extent of patient engagement with self-management support information and the effectiveness of its impact can depend upon website accessibility, in addition to the individual’s own digital and health literacy levels [15].

Health literacy refers to the cognitive and social skills which determine the motivation and ability of individuals to access, understand and use information to make suitable decisions and take appropriate actions in relation to their health [16]. The ability to read and comprehend information is an essential factor within health literacy; individuals who lack basic literacy skills are less able to act upon health education information [17]. People with lower levels of health demonstrate lower adherence to treatment plans and are less likely to engage with self-management strategies, resulting in poorer health outcomes than people with adequate health literacy levels [18]. The National Literacy Trust states that 5.2 million adults in the UK are functionally illiterate, with a literacy level at or below that of an 11-year-old [19]. Health literacy typically declines with ageing [20], making it a particularly important issue for musculoskeletal services, as OA is an age-related condition [21]. Furthermore, the condition is disproportionally prevalent in lower socioeconomic groups, which have a greater prevalence of individuals with lower levels of health literacy [22].

Readability (how difficult text is to read) is an essential quality indicator for accessibility and is recognised by the Web Content Accessibility Guidelines published by the World Wide Web Consortium’s Web Accessibility Initiative – these state that online text content should be readable and understandable [23]. A variety of tools exist to measure readability, including the Simple Measure of Gobbledegook (SMOG) and Gunning Fog Index, both of which calculate a readability score equivalent to a US grade level, based on the length of sentences and number of polysyllabic words in the text [24]. High readability levels have been found to reduce the accessibility of health information [25], and it is recommended that patient-oriented healthcare information is written at or below 6th grade level, corresponding to a reading age of 11 [26]. However, routinely used patient-reported outcome measures and consent forms within rheumatology rarely meet the recommended reading level for health education literature [27, 28]. Previous studies assessing online resources for people with arthritis also identified that most information was written at reading grades well above 6th grade level [29-31].

Webpage accessibility can also depend on how information is presented and conveyed [23]. Health literacy guidelines recommend that online health information is supported by the inclusion of simple, relevant images, and shared through multimedia in order to improve understanding and engagement [32]. Patient and public involvement (PPI) groups have also identified that visual information, in addition to seeing others in similar situations successfully manage chronic joint pain, e.g. through video resources, are helpful factors to encourage engagement within self-management approaches [33].

No research to date has investigated the accessibility of webpages offering self-management support for people with OA. Lower readability levels of text [25], and images and videos that support text [23, 32-33], can improve accessibility. The aim of this study was therefore to assess the accessibility of English language webpages providing self-management support for people with OA by considering readability, using two validated readability measures, and by establishing whether informative images and videos were included within these webpages. This study was informed by and developed alongside PPI representatives who helped define the internet key word search strategy for identification of frequently accessed OA self-management webpages.

**Methods**

This was a non-experimental, descriptive internet-based study.

*Developing and implementing a search strategy*

Key search terms were developed in collaboration with PPI representatives with OA. As research partners rather than participants [33], PPI representatives provided input to ensure the exploration incorporated lay perspectives and priorities to enhance the study design. Pain was identified by the PPI representatives as the principal motivation to seek information and advice online, and it was considered that the location of pain would form the basis of any internet search for self-help advice. PPI representatives also stated that they would not use terms such as “osteoarthritis” or “self-management”, which they considered to be medical phrases. The search terms “joint pain”, “arthritis pain”, “knee pain”, “hip pain” and “hand pain” were initially entered individually into a search engine. Although OA can affect any joint, the knee, hip and hand are three of the most frequently involved [1]. Each key phrase was then entered into the search engine in combination with each of the following PPI-informed terms “helping”, “improving”, and “treating”. This resulted in a total of 20 unique searches. All combinations of search terms are displayed in Table 1. Searches were conducted between 20th September and 14th October 2016.

Please insert Table 1 around here.

Google.co.uk was selected as the search engine, as the majority of internet users use Google as their primary resource for internet searches [34]. Additionally, Google ranks webpages based on relevance and usefulness by using algorithms that take into account factors such as keyword usage, website structure, average duration on the website, and the quality of inbound links [34]. Research into online behaviour suggests that over 90% of internet users do not explore further than the first page of search engine results [35]. Therefore, to reflect regular internet behaviour, the first page of Google search results were assessed and included in the analysis based on inclusion criteria modified from search strategies in previous website readability studies [30, 36] (Table 2). Search results were not country-specific, as Google UK’s default settings specify that search results can be from any country. If a webpage was introductory and included a series of links to other webpages, the first available link relating to self-management of OA was assessed. Webpage eligibility screening, and analyses of webpage readability, image and video inclusion, were carried out by one author (LC).

Please insert Table 2 around here.

*Readability assessment criteria*

Applying more than one readability tool to written information improves the reliability of readability scores [25], therefore the readability of webpages in this study was assessed using two validated readability tools – SMOG and the Gunning Fog Index, in order to determine the reading grade required to fully understand the text. Both tools have been shown to be more accurate than other formulae when applied to written health information, and as such have been frequently applied to health education materials [37, 38].

All text from each webpage meeting the inclusion criteria was transferred to a Microsoft Word document and prepared for analysis. For SMOG, the number of polysyllabic words in ten consecutive sentences from the beginning, middle and end of the Microsoft Word document were counted manually. Standardised SMOG procedures [39] were then followed: 3.1291 was added to the square root of the total number of polysyllabic words in the thirty sentences analysed, and this figure was multiplied by 1.043 to establish the reading grade level. For the Gunning Fog Index, a random sample of 100 consecutive words from each Microsoft Word document was analysed manually. In both cases, only body text was included; titles and subtitles were excluded from the analysis. To reduce the potential for researcher bias, a random number generator was used to determine the starting sentence for passage analysis. Gunning Fog Index scores were calculated using standardised procedures [40]; the sentence length was added to the percentage of polysyllabic words and this figure was multiplied by 0.4. If there was any uncertainty regarding the number of syllables per word, the word was entered into a syllable checker. The scores produced from the SMOG and Gunning Fog Index calculations corresponded to the US grade level required to understand the text.

*Assessment of image-to-text ratio and inclusion of videos*

Each webpage meeting the inclusion criteria was assessed for the number of informative images and videos included. Web Content Accessibility Guidelines clearly distinguish between informative images, which graphically represent concepts and information, and decorative images, which solely add visual decoration to a webpage without conveying any information [41]. Health literacy guidelines for online health information recommend that graphics enhance and explain content and that media supports text [32]. Therefore, only images graphically representing text were counted in the analysis, and only relevant videos were counted. Videos were considered to be relevant if they provided information aiming to help people self-manage the pain in their joints, such as those depicting patients in similar situations discussing self-management techniques.

**Results**

Forty-nine webpages (n = 49) met the inclusion criteria (figure 1) and were analysed for readability levels, image inclusion, and video inclusion (appendix 1). Twenty-four (n= 24) webpages were commercial, whilst 25 (n = 25) were national government, charitable, or non-profit (table 3).

Please insert Figure 1 around here.

Please insert Table 3 around here.

*Webpage readability*

Webpage reading grade levels ranged from 6.39-14.7 (SMOG) and 4.96-13.6 (FOG). The mean SMOG grade for all webpages was 11.09 (corresponding to UK school age of 16 years) and the mean FOG grade was 9.8 (corresponding to UK national school age of 14 years, 9 months). The most readable webpage analysed using SMOG was from WebMD (SMOG grade 6.39), whilst the most readable webpage analysed using the Gunning Fog Index was from Healthline (FOG grade 4.96). The least readable webpage analysed with SMOG was from Arthritis Foundation (SMOG grade 14.7), and the least readable webpage analysed with FOG was from Health Harvard (FOG grade 13.6). Commercial webpages (mean SMOG grade 10.7; mean FOG grade 9.37) were more readable on average than government, charity and non-profit websites (mean SMOG grade 11.46; mean FOG grade 10.12).

*Image-to-text ratio and video inclusion*

Twenty-two webpages (n = 22, 44.9%) neglected to include any informative images to supplement text. Of these, 13 (n = 13, 59%) were government, charity and non-profit webpages, whilst nine (41%) were commercial webpages. Examples of images that were assessed as informative included those depicting people doing specific joint exercises alongside written instructions, and pictures of relevant foods alongside written healthy eating and diet advice.

Three of the 49 webpages (n = 3, 6.12%), two (n =2) from NHS Choices and one (n = 1) from Everyday Health, included relevant videos to support written information. These videos were considered relevant as they included people with OA talking about self-management techniques.

**Discussion**

This study aimed to explore the accessibility of English language webpages providing self-management support for people with OA by considering readability level of text and the inclusion of images and videos. Findings from this study have important implications for the publication of online OA self-management information resources when patients are increasingly being encouraged to take control of their own health conditions [5]. The results indicated that webpages providing self-management support for people with OA are currently failing to meet recommended readability guidelines [26]. Only one of the 49 webpages reviewed using SMOG, and four of the webpages reviewed using Gunning Fog Index, met recommended readability guidelines of 6th grade level or below. These findings are consistent with previous studies measuring the readability of online information relating to arthritis [29-31], wherein reading levels were consistently above 6th grade level.

The majority of webpages reviewed in the current study could potentially be inaccessible, in terms of readability, to people with lower literacy levels. If the information published on self-management support webpages is too difficult to read, it cannot be understood and acted upon to successfully self-manage OA by patient populations with lower literacy levels [24], who currently have the least effective outcomes when using NHS services [15].

Webpage accessibility, and specifically the engagement with OA self-management information among people with lower literacy levels, may also depend on the inclusion of visual and interactive information [30, 32]. Almost half of the webpages assessed in this study failed to include any informative images to support written text, and only a minority of webpages included videos, which may further negatively impact on the comprehension and effective uptake of online OA self-management information.

Findings from this study also have important implications for webpage authors. Although health professionals may directly signpost patients to trusted websites, such as those from organisations certified by the Information Standard for trustworthy health information [42], this study utilised PPI representatives to consider an internet search from the patient’s perspective, so the webpages analysed reflected those that would be returned from a self-motivated, patient-led search. Almost half of these webpages were commercial, and this study found that, on average, commercial webpages were slightly more readable than national government, charity and non-profit webpages, and were more likely to include informative images alongside text. Health information on webpages authored by government and charitable organisations is considered to be more trusted and reputable, yet previous research has identified that people with arthritis are unconcerned about the absence of government or reputable arthritis charity endorsement on websites [33]. People with OA could therefore be gaining more accessible self-management information from lest trustworthy sources, but further research is required to determine the quality, relevance and accuracy of information provided on OA self-management support webpages.

Findings from this study must be considered in light of certain limitations, and additional areas for further research have been identified. The study’s results must be interpreted with caution, as the online information reviewed may have been amended or updated since the analysis was conducted. Although the search strategy was developed in collaboration with PPI representatives, it is not possible to determine if this accurately reflected the internet search terms used by the wider population of people with OA when seeking self-management support online, thus selection bias cannot be ruled out. This study considered readability, which is one quality indicator of accessibility. However, whilst readability tools allow the reading difficulty of text to be assessed and measured against readability guidelines, they cannot consider the reader’s subjective opinion and do not measure comprehension. This study also analysed the inclusion of informative images and relevant videos as measures of webpage accessibility, but did not consider the impact of the number of images published or the additional use of decorative images, which may distract the reader and therefore reduce accessibility [35]. Webpage accessibility can also be dependent upon other quality indicators such as format, font, and font size, the use of the active voice in descriptive text, and colour schemes [43, 44], which were not considered in this study.

This study excluded blogs, forums and social media. However, use of these online platforms in relation to health is increasing, and it could be that such websites hold the potential for continuing to develop the effective uptake of OA self-management education. A qualitative study determining patients’ subjective experiences of OA self-management webpages may give a more comprehensive measure of their accessibility, whilst encouraging “think-aloud” techniques [45] could reveal perceptions of OA webpage navigation and usability. Exploring patients’ experiences and preferences for online information relating to OA self-management could reveal improvements to optimise the success of these webpages in helping people with the condition to self-manage their symptoms. Finally, given the increase of internet access on mobile phones, with 75% of adults currently using smartphones to access the internet [12], future studies could explore the accessibility and usability of OA self-management support webpages on mobile devices. These could incorporate assessments of physical accessibility, which is a particularly important issue for people with OA, where fine motor skills can be affected.

**Recommendations**

To improve the readability of webpages offering OA self-management support, information should be written avoiding long sentences, polysyllabic words and medical jargon [32]. The inclusion of informative images and relevant videos to support written text may also improve webpage accessibility [32-33, 41]. Health literacy training could be provided for the health professionals involved in developing online written healthcare materials, and the information published on OA self-management webpages could be written and reviewed in collaboration with PPI groups in order to obtain the layperson’s perspective of accessibility, and checked for readability before being published.

 Conclusions

Effective self-management of chronic conditions such as OA is a key target for health providers, but webpages aiming to support patients to self-manage this condition are failing to meet current readability guidelines and may not be read, understood or used effectively by many people. Webpages aiming to help people with OA self-manage their condition need to be more accessible to reduce healthcare inequalities arising from differing literacy levels.

**Funding statement**

This research was supported by an Arthritis Research UK public health internship (grant reference 20867).

**Declaration of conflicting interests**

The Authors declare that there is no conflict of interest in submitting this original research.

**References**

1. WHO Department of Chronic Diseases and Health Promotion. Available at: http://www.who.int/chp/topics/rheumatic/en/
2. Wylde V, Hewelett S, Learmonth ID, Cavendish VJ (2006) Personal impact of disability in osteoarthritis: patient, professional and public values. *Musculoskeletal Care* 4 (3):152-66.
3. Hill, S., Dziedzic, K., Ong, B. (2009) The functional and psychological impact of hand osteoarthritis. *Chronic Illness* 6: 101-110.
4. NHS England Programme Budgeting Data (2012-3). Accessed at: http://www.england.nhs.uk/resources/ resources-for-ccgs/prog-budgeting/
5. Department of Health (2010c) *Healthy Lives, Healthy People: Our Strategy for Public Health in England*. London: HMSO
6. National Institute for Health and Care Excellence (2014) *Osteoarthritis: care and management. Clinical Guideline CG177*. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/198114/National\_Service\_Framework\_for\_Long\_Term\_Conditions.pdf
7. Bodenheimer T, Lorig K, Holman H, Grumbach K (2002) Patient self-management of chronic disease in primary care. *Jama* 288(19):2469-75.
8. Fransen M, McConnell S, Harmer AR et al (2015) Exercise for osteoarthritis of the knee. *Cochrane Database Syst Rev* 9:1:CD004376.
9. Christensen R, Bartels EM, Astrup A, Bliddal H. (2007) Effect of weight reduction in obese patients diagnosed with knee osteoarthritis: a systematic review and meta-analysis. *Ann Rheum Dis.* 66(4):433-439.
10. Liu R, Damman W, Kaptein AA et al. (2016) Coping styles and disability in patients with hand osteoarthritis. *Rheumatology* (Oxford) 55 (3):411-8.
11. Riskowski J, Dufour AB, Hannan MT (2011) Arthritis, foot pain and shoe wear: current musculoskeletal research on feet. *Curr Opin Rheumatol* 23(2):148-55.
12. Office for National Statistics (2016) *Statistical bulletin: Internet users in the UK: 2016*. Accessed at: https://www.ons.gov.uk/businessindustryandtrade/itandinternetindustry/bulletins/internetusers/2016
13. Pew Research Center (2017) Internet broadband fact sheet. Accessed at: http://www.pewinternet.org/fact-sheet/internet-broadband/
14. Whitehead L, Seaton P. (2016) The effectiveness of self-management mobile phone and tablet apps in long-term condition management: a systematic review. J Med Internet Res: 18 (5) e97.
15. Public Health England (2015) Improving health literacy to reduce health inequalities. Accessed at: https://www.gov.uk/government/uploads/system/uploads/attachment\_data/file/460709/4a\_Health\_Literacy-Full.pdf
16. Nutbeam, D. (1998) Health promotion glossary. Health Promotion International, 13, 349–364.
17. Nutbeam D (2000) Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promot. Int.* 15 (3):259-267.
18. Berkman ND, Sheridan SL, Donahue KE et al. (2011) Health literacy interventions and outcomes: An updated systematic review. *Evid Rep Technol Assess* (Full Rep). 2011 Mar;(199):1-941.
19. National Literacy Trust (2010) *Literacy: State of the nation. A picture of literacy in the UK.* London, England: National Literacy Trust, 2012.
20. Zamora J, Clingerman EM (2011) Health Literacy among older adults: a systematic literature review. *J Gerontol Nurs* 37(10):41-51.
21. Anderson AS, Loeser RF (2010) Why is osteoarthritis an age-related disease? *Best Pract Res Clin Rheumatol* 24 (1): 15.
22. Cleveland RJ, Luong MN, Knight JB et al (2013) Independent associations of socioeconomic factors with disability and pain in adults with knee osteoarthritis. *BMC Musculoskeletal Disorders* 14:297.
23. World Wide Web Consortium. Web Accessibility Initiative: Web accessibility standards. Accessed at: https://www.w3.org/WAI/intro/people-use-web/principles#standards.
24. Friedman DB, Hoffman-Goetz L (2006) A systematic review of readability and comprehension instruments used for print and web-based cancer information. *Health Educ Behav* 33(3):352-73.
25. Thomson, MD, Hoffman-Goetz L (2007) Readability and cultural sensitivity of web-based patient decision aids for cancer screening and treatment: a systematic review. *Med Inform Internet Med* 32: 263-86.
26. The National Work Group on Literacy and Health (1998) Communicating with patients who have limited literacy skills. *J Fam Pract* 46:168-76.
27. Adams J, Chapman J, Bradley S, Ryan SJ (2013) Literacy levels required to complete routinely used patient-reported outcome measures in rheumatology. *Rheumatology* 52 (3): 460-464.
28. Hamnes B, van Eijk-Hustings Y, Primdahl J (2016) Readability of patient information and consent documents in rheumatological studies. *BMC Med Ethics* 17:42.
29. Thompson AE, Graydon SL (2009) Patient-oriented methotrexate information sites on the Internet: a review of completeness, accuracy, format, reliability, credibility, and readability. *J Rheumatol* 36 (1): 41-9.
30. Stinson JN, Tucker L, Huber A, et al. (2009) Surfing for juvenile idiopathic arthritis: perspectives on quality and content of information on the Internet. *J Rheumatol* 36(8): 1755-62.
31. Kamal R, Paci GM, Daniels AH, Weiss AP (2014) Quality of internet health information on thumb carpometacarpal joint arthritis. *Rhode Island Medical Journal* 97(4): 31-5.
32. Office of Disease Prevention and Health Promotion (2016) Health Literacy Online: A guide for simplifying the user experience. Available at: https://health.gov/healthliteracyonline.
33. Adams J, Whale E, Walker D, et al. (2016) [What factors do people with joint pain feel are important in designing and developing community information-based self-management approaches? A patient and public engagement report](http://eprints.soton.ac.uk/398556/). *Musculoskeletal Care*, doi: [10.1002/msc.1158](http://dx.doi.org/10.1002/msc.1158).
34. eBizMBA. Top 15 most popular search engines: August 2016. Accessed at: http://www.ebizmba.com/articles/search-engines.
35. Van Deursen AJ, van Dijk JA. (2009) Using the Internet: Skill related problems in users’ online behaviour. *Interacting with Computers* 21 (5-6): 393-402.
36. Brooks C, Ballinger C, Nutbeam D, Adams J (2013) Literacy levels required to understand regularly accessed falls prevention websites aimed at the public. *Journal of Physical Therapy and Health Promotion*, 1 (1), 8-14.
37. Wang L, Miller MJ (2012) Assessing readability formula differences with written health information materials: application, results and recommendations. *Research in Social and Administrative Pharmacy* 9: 503-516.
38. Fitzsimmons PR, Michael BD, Hulley JL, Scott GO (2010) A readability assessment of online Parkinson’s disease information. *J R Coll Physicians Edinb* 40 (4): 292-6.
39. McLaughlin, H (1969) SMOG grading: a new readability formula. *Journal of Reading*, 12(8): 639-646.
40. Gunning, R (1952) *The Technique of Clear Writing*. New York: McGraw-Hill.
41. World Wide Web Consortium. Web Accessibility Initiative: Images concepts. Accessed at: https://www.w3.org/WAI/tutorials/images.
42. NHS England (2017) The Information Standard. Accessed at: https://www.england.nhs.uk/tis/about/description/
43. Heron, E., Winchcombe M., Cobbledick J., Adams J (2017) Working with service users to design an accessible health website for people with arthritis and lower levels of digital literacy:  British Society of Rheumatology Annual Conference Rheumatology S1.
44. Smith, H., Gooding, S., Brown, R., Frew, A. (1998) Evaluation of readability and accuracy of information leaflets in general practice for patients with asthma. BMJ 317(7153): 264–265.
45. Lundgren-Laine H, Salantera S (2010) Think-aloud technique and protocol analysis in clinical decision-making research. *Qualitative Health Research* 20(4):565-575.

**Appendix 1.** List of webpages analysed

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Webpage URL** | **SMOG** | **FOG** | **Informative image(s)** | **Relevant video(s)** |
| 1 | https://www.arthritiscare.org.uk/managing-arthritis | 9.94 | 9.29 | Yes | No |
| 2 | <http://www.arthritis.org/living-with-arthritis/arthritis-diet/best-foods-for-arthritis/best-foods-for-arthritis.php>  | 12.23 | 12.5 | Yes | No |
| 3 | <http://www.arthritis.org/about-arthritis/understanding-arthritis/arthritis-self-management.php>  | 13.1 | 8.04 | No | No |
| 4 | <http://www.arthritis.org/living-with-arthritis/exercise/benefits/exercises-for-hip-pain.php>  | 14.7 | 13.5 | No | No |
| 5 | http://www.arthritis.org/living-with-arthritis/exercise/benefits/exercise-knee-osteoarthritis.php  | 14 | 12 | No | No |
| 6 | <http://www.arthritis.org/living-with-arthritis/pain-management/tips/arthritis-pain-relief-alternatives.php>  | 13.05 | 10.8 | No | No |
| 7 | <http://www.arthritisresearchuk.org/arthritis-information/common-pain/hip-pain/what-can-i-do-to-help-myself.aspx>  | 12.59 | 7.59 | No | No |
| 8 | <http://www.arthritisresearchuk.org/arthritis-information/arthritis-and-daily-life/pain-and-arthritis/pain-report/living-with-longterm-pain/what-should-i-do-to-deal-with-longterm-pain.aspx>  | 10.56 | 9.7 | No | No |
| 9 | <http://www.arthritisresearchuk.org/arthritis-information/conditions/osteoarthritis-of-the-knee/self-help-and-daily-living.aspx>  | 11.21 | 9.24 | No | No |
| 10 | <http://www.arthritisresearchuk.org/arthritis-information/arthritis-and-daily-life/diet-and-arthritis.aspx> | 13.9 | 11.3 | No | No |
| 11 | <http://www.arthritisresearchuk.org/arthritis-information/conditions/arthritis/self-help-and-daily-living.aspx>  | 11 | 9.24 | No | No |
| 12 | <http://www.arthritisresearchuk.org/arthritis-information/conditions/osteoarthritis-of-the-knee/knee-pain-exercises.aspx>  | 7.16 | 5.65 | Yes | No |
| 13 | <http://www.everydayhealth.com/arthritis/pain-and-stiffness.aspx>  | 11.99 | 11.7 | No | No |
| 14 | <http://www.everydayhealth.com/hip-pain-photos/ways-to-relieve-hip-pain.aspx>  | 10.48 | 9.86 | Yes | No |
| 15 | <http://www.everydayhealth.com/hip-pain/hip-pain-home-remedies.aspx>  | 9.94 | 8.48 | No | No |
| 16 | <http://www.everydayhealth.com/arthritis/arthritis-fingers-hands.aspx>  | 13.8 | 10.40 | No | Yes |
| 17 | <http://www.gaiam.com/discover/250/article/10-ways-relieve-prevent-joint-pain/>  | 12.76 | 10.10 | Yes | No |
| 18 | <http://life.gaiam.com/article/best-ways-ease-knee-pain-5-tips-physical-therapist>  | 13.1 | 12.9 | Yes | No |
| 19 | <http://www.healthline.com/health/osteoarthritis/hip-exercises-treatment>  | 11 | 7.56 | No | No |
| 20 | <http://www.healthline.com/health/pain-relief/knee-pain-home-remedies#AlternativeTherapies5>  | 12.17 | 12.00 | Yes | No |
| 21 | <http://www.healthline.com/health/osteoarthritis/hip-treatments> | 9.56 | 5.26 | Yes | No |
| 22 | [www.healthline.com/health/osteoarthritis/arthritis-**hand**-exercises](http://www.healthline.com/health/osteoarthritis/arthritis-hand-exercises)  | 9.07 | 4.96 | Yes | No |
| 23 | <http://www.healthline.com/health/osteoarthritis/arthritis-natural-relief> | 12.87 | 11.00 | Yes | No |
| 24 | [http://www.health.com/health/gallery/0,,20443624,00.html](http://www.health.com/health/gallery/0%2C%2C20443624%2C00.html)  | 13.97 | 12.80 | Yes | No |
| 25 | <http://www.healthcommunities.com/healthy-living-guides/index.shtml/10-ways-to-relieve-knee-pain> | 12.00 | 10.7 | Yes | No |
| 26 | <http://www.health.harvard.edu/pain/5-exercises-to-improve-hand-mobility-and-reduce-pain> | 9.10 | 10.10 | Yes | No |
| 27 | <http://www.health.harvard.edu/pain/top-5-ways-to-reduce-crippling-hand-pain> | 10.63 | 10.80 | Yes | No |
| 28 | <http://www.health.harvard.edu/nutrition/can-diet-improve-arthritis-symptoms>  | 13.05 | 13.6 | Yes | No |
| 29 | <http://www.health.harvard.edu/healthbeat/the-secret-to-joint-pain-relief-exercise>  | 10.93 | 10.6 | No | No |
| 30 | <http://www.mayoclinic.org/diseases-conditions/knee-pain/manage/ptc-20190237> | 11.00 | 9.82 | No | No |
| 31 | <http://www.mayoclinic.org/diseases-conditions/arthritis/multimedia/arthritis/sls-20076952> | 8.58 | 7.89 | Yes | No |
| 32 | <http://www.mayoclinic.org/diseases-conditions/arthritis/in-depth/arthritis/art-20047971> | 12.48 | 9.81 | No | No |
| 33 | <https://medlineplus.gov/ency/article/003179.htm>  | 8.78 | 7.33 | No | No |
| 34 | <https://medlineplus.gov/ency/article/003187.htm>  | 10.18 | 7.75 | Yes | No |
| 35 | <http://www.nhs.uk/conditions/osteoarthritis/Pages/Introduction.aspx>  | 11.67 | 12.50 | No | Yes |
| 36 | <http://www.nhs.uk/Conditions/Arthritis/Pages/Livingwitharthritispg.aspx>  | 11.93 | 12.50 | Yes | No |
| 37 | [www.nhs.uk/conditions/hip-pain adults/Pages/Introduction.aspx](http://www.nhs.uk/conditions/hip-pain%20adults/Pages/Introduction.aspx)  | 10.86 | 10.5 | Yes | No |
| 38 | http://www.nhs.uk/Conditions/Osteoarthritis/Pages/treatment.aspx | 13.97 | 10.84 | No | Yes |
| 39 | <http://www.prevention.com/fitness/exercises-knee-pain>  | 8.78 | 5.5 | Yes | No |
| 40 | <http://www.prevention.com/health/health-concerns/best-treatments-knee-pain> | 9.61 | 9.87 | Yes | No |
| 41 | <http://www.top10homeremedies.com/home-remedies/home-remedies-knee-pain.html>  | 11.14 | 8.13 | Yes | No |
| 42 | <http://www.top10homeremedies.com/home-remedies/home-remedies-for-arthritis-in-hands.html> | 11.98 | 9.24 | Yes | No |
| 43 | <http://www.webmd.com/arthritis/ss/slideshow-keep-joints-healthy> | 8.88 | 7.54 | Yes | No |
| 44 | <http://www.webmd.com/osteoarthritis/guide/arthritis-footcare-shoes#1> | 9.78 | 10.2 | No | No |
| 45 | <http://www.webmd.com/osteoarthritis/oa-treatment-options-12/slideshow-hand-finger-exercises>  | 6.39 | 7.48 | Yes | No |
| 46 | <http://www.webmd.com/osteoarthritis/features/knee-hip-exercises>  | 11.54 | 9.83 | No | No |
| 47 | <http://www.webmd.com/pain-management/knee-pain/knee-problems-and-injuries-home-treatment>  | 8.88 | 12.3 | No | No |
| 48 | <http://www.webmd.com/osteoarthritis/knee-pain-dos-and-donts>  | 8.58 | 7.31 | No | No |
| 49 | <http://www.wikihow.com/Ease-Hip-Pain>  | 8.58 | 9.81 | Yes | No |

**Table 1. Search term combinations**

|  |  |  |  |
| --- | --- | --- | --- |
| Joint pain | Helping joint pain | Improving joint pain | Treating joint pain |
| Arthritis pain | Helping arthritis pain | Improving arthritis pain | Treating arthritis pain |
| Knee pain | Helping knee pain | Improving knee pain | Treating knee pain |
| Hip pain | Helping hip pain | Improving hip pain | Treating hip pain |
| Hand pain | Helping hand pain | Improving hand pain | Treating hand pain |

**Table 2.Inclusion and exclusion criteria for webpages**

|  |  |
| --- | --- |
| **Inclusion criteria** | **Exclusion criteria** |
| 1. Main topic of osteoarthritis.  | 1. Web page already analysed via a different URL.
 |
| 2. Aimed at the public. | 1. Main topic unrelated to osteoarthritis.
 |
| 3. Aimed at adults. | 1. Chat rooms, blogs, social networking, discussion groups and internet forums.
 |
| 4. Offering self-management support and advice regarding strategies to engage in healthy behaviours. Webpages were considered relevant if they provided sufficient information to answer the question, “how can I help the pain in my joints?”  | 1. Aimed at healthcare professionals or researchers.
 |
| 5. Written in the English language. | 1. Focussing on detailed pharmacological or pathophysiological information relating to osteoarthritis.
 |
| 6. Unlimited access with no membership fees. | 1. Access denied due to password requirements or repeated server unavailable.
 |
|  | 1. Solely advertisements for products or organisations relating to joint pain without any information relating to self-management.
 |
|  | 1. Wholly downloadable PDF, PowerPoint or Word document (offline information).
 |

**Figure 1.**Flow diagram identifying webpages included and excluded from the analysis.

Webpages meeting inclusion criteria and assessed for text readability, image-to-text ratio and video inclusion (n = 49).

Results from first page of Google.co.uk searches returned from 20 searches (n = 262)

Duplicate webpages (n = 60)

Repeated server unavailable (n = 1)

Unrelated to OA (n = 24)

Solely advertisements (n = 77)

Insufficient self-management information provided (n = 38)

Personal blogs or forums (n = 5)

Aimed at health professionals/researchers (n = 3)

Detailed pharmacological/pathophysiological information (n = 5)

**Table 3. List of websites assessed.**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Website author** | **Website URL** | **Type of website** | **No. of analysed webpages from site (n = 49)** |
| 1 | Arthritis Care | www.arthritiscare.org.uk | Charity | 1 |
| 2 | Arthritis Foundation | www.arthritis.org | Charity | 5 |
| 3 | Arthritis Research UK | www.arthritisresearchuk.org | Charity | 6 |
| 4 | Everyday Health  | www.everydayhealth.com | Commercial | 4 |
| 5 | Gaiam | www.gaiam.com | Commercial | 2 |
| 6 | Health.com (Time Inc.) | www.health.com  | Commercial | 1 |
| 7 | Healthline Media | www.healthline.com | Commercial | 5 |
| 8 | Health Communities (Remedy Health Media) | www.healthcommunities.com | Commercial | 1 |
| 9 | Health Harvard  | www.harvard.health.edu | Non-profit | 4 |
| 10 | Mayo Clinic | www.mayoclinic.com | Non-profit | 3 |
| 11 | Medline Plus | www.medlineplus.gov | Government | 2 |
| 12 | NHS Choices | www.nhs.uk | Government | 4 |
| 13 | Prevention.com (Rodale Inc.) | www.prevention.com | Commercial | 2 |
| 14 | Top10remedies.com | www.top10remedies.com | Commercial | 2 |
| 15 | Web MD | www.webmd.com | Commercial | 6 |
| 16 | WikiHow | www.wikihow.com | Commercial  | 1 |