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Research Letter

Coronavirus (COVID-19) vaccination information must pay attention to health literacy: analysis of readability of official COVID-19 public health information

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Abstract

This paper analyses the readability of official COVID-19 public health information, specifically comparing vaccination information to physical distancing and mask information. We assessed understandability and instruction clarity (actionability) for standard online content and 'easy read' resources. COVID-19 vaccination information performed poorly on all readability metrics which may have implications for vaccine confidence.

Introduction

Throughout the coronavirus (COVID-19) pandemic there has been limited attention to the information needs of people with lower health literacy and people from culturally and linguistically diverse backgrounds. In April 2020, research showed that vast majority of government COVID-19 information developed in Australia and internationally exceeded the recommended 8th grade reading level, rendering it too difficult for general audiences, notwithstanding those with lower health literacy.¹ Since then, mass global vaccination has begun bringing new information to communicate. This study compares Australian and international COVID-19 vaccination information to other COVID-19 information (physical distancing and mask wearing) and provides an updated and local assessment of understandability and actionability including ‘easy-read’ resources developed in Australia and New Zealand.

Methods

Between March and April 2021, we purposively selected consumer-facing information about vaccination, physical distancing, and face masks for COVID-19 from government websites of Australia (Federal and three states), New Zealand and the United Kingdom and three international Public Health Agencies (Centers for Disease Control and Prevention (CDC), European Centre for Disease Prevention and Control (ECDC) and World Health Organization (WHO). We also searched each site for resources labelled as ‘easy-read’. Readability was assessed using the Simple Measure of Gobbledygook (SMOG) which estimates grade reading level (range 5 to 18). Grade 8 is recommended for general audiences. To complement readability, we used the widely established Patient Education Materials Assessment Tool (PEMAT)². The PEMAT uses 24 items to measure ‘*understandability*’, including elements such as word choice, use of visual aids, layout and organisation; and ‘*actionability*’, which assesses the clarity of actions or steps the user can take to follow the health advice. Two researchers independently scored each PEMAT item (n=24; 1-Agree, 0-Disagree or NA-Not Applicable), with discrepancies resolved by discussion. Total score is a proportion of all *Agree* responses.³ A score of $\geq 70\%$ is considered adequate³. Agreement was assessed using Cohen’s kappa coefficient. Additional methodological details are provided in Appendix 1 where we have also provided some exemplar websites differing by readability, understandability and actionability.

Statistical analyses used Microsoft Excel and SPSS version 26.0 (IBM). Kruskal-Wallis tests compared medians across topics (vaccination, physical distancing and mask wearing); significance defined as $P < 0.05$. Analyses are presented separately for 'standard' and 'easy read' content.

Results

All standard content exceeded an 8th grade reading level. The median grade reading level was 12.0 (interquartile range [IQR], 2.0; Table 1) The median grade reading level of vaccination information (13.0; IQR, 2.0) was significantly higher than physical distancing (11.5; IQR, 2.0; $p = 0.007$), and mask information (11.0; IQR, 2.3; $p < 0.001$). Twelve of the 21 easy-read content (55%) exceeded an 8th grade reading level. The median grade reading level of easy-read content about vaccination (10.0; IQR, 1.0) was also significantly higher than information about physical distancing, (7.0; $p = 0.03$) and masks (7.5; IQR, 1.5; $p = 0.036$).

The median understandability score of standard content was 87.7% (IQR 16.4). Most standard content ($n = 20/24$, 83%) met the recommended understandability threshold ($> 70\%$). Median understandability scores for vaccination were 83.3% (IQR, 17.9) , 92.8% (IQR, 21.7) for physical distancing, and 92.8% (IQR, 7.0) for masks. These differences were not significant ($p = 0.074$). The median actionability score of standard content was 80% (IQR, 40) however, less than half ($n = 14/24$, 46%) met the recommended actionability threshold. All easy-read content ($n = 12$, 100%) met the threshold for understandability (median, 87.5%; IQR, 0.6), while only 3 (25%) met the actionability threshold (median, 60.0%; IQR, 20.0). Kappa agreements were rated as substantial (> 0.70).

Discussion

Twelve months since the onset of the pandemic, much of the COVID-19 public health information in Australia and internationally still performs poorly on readability metrics, and on measures of 'actionability'. Of concern, vaccination information was the hardest to read, understand, and act upon according to widely used metrics, compared to information about physical distancing and face masks. The existence of easy-read content (with better readability and understandability) demonstrates it is possible to explain COVID-19 topics in

plain language, however, they were few in number and difficult to locate on the website.

Public health information should be easily accessible to the general population. Despite plain language being endorsed by WHO and the Institute of Medicine for over a decade, there remains a disconnect between guidelines and practice internationally³.

The high health literacy demands of vaccination information is a pertinent issue in Australia and has important implications for vaccine uptake .^{4,5} Successful management of COVID-19 requires a whole of community response. This necessitates effective public communication and a strong commitment to health literacy.

References

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Table 1. Readability, understandability, and actionability of official COVID-19 public health information

	Number of webpages*	Readability (recommended grade reading level ≤8)	PEMAT (≥70% = understandable/actionable)#	
		SMOG index Median (IQR) [range] [†]	Understandability (%)	Actionability (%)
STANDARD CONTENT: Vaccination (n=39)				
Australia	16	13.0 (1.5) [12-15]	82.9 (15.2) [75-93]	64.5 (32.2) [60-100]
Federal DOH	11	13.0 (1.0) [12-14]	80.0	100.0
New South Wales	1	12.0	75.0	60.0
Queensland	1	12.0	93.3	60.0
Victoria	3	14.0 (2.0) [13-15]	85.7	60.0
New Zealand	3	13.0 [11-14]	85.7	60.0
United Kingdom	1	12.0	83.3	80.0
CDC	16	13.0 (2.5) [11-16]	86.7	100.0
ECDC	1	18.0	25.0	0.0
WHO	1	15.0	61.5	40.0
Physical distancing (n=10)				
Australia	4	11.5 (1.8) [11-13]	96.7 (7.4) [92-100]	90.0 (35.0) [60-100]
Federal DOH	1	12.0	93.3	100.0
New South Wales	1	13.0	100.0	80.0
Queensland	1	11.0	93.3	60.0
Victoria	1	11.0	92.3	60.0
New Zealand	1	11.0	84.6	60.0
United Kingdom	1	11.0	76.9	60.0
CDC	1	13.0	93.3	100.0
ECDC	2	13.5 [12-15]	62.5	60.0
WHO	1	11.0	93.3	100.0
Masks (n=22)				
Australia	10	11.0 (1.25) [9-12]	93.5 (5.7) [87-94]	90.0 (35.0) [40-100]
Federal DOH	1	11.0	86.7	100.0
New South Wales	1	10.0	100.0	80.0
Queensland	1	10.0	93.3	60.0
Victoria	7	11.0 (2.0) [9-12]	94.1	100.0
New Zealand	3	9.0 [9-12]	93.3	100.0
United Kingdom	1	14.0	76.9	60.0
CDC	7	10.0 (2.0) [9-12]	86.7	100.0
WHO	1	12.0	92.3	100.0
EASY READ CONTENT: Vaccination (n=12)				
Australia (Federal DOH)	11	10.0 (1.0) [8-10]	87.1 (0.4)	60.0 (0.0)
New Zealand	1	10.0	87.5	60.0
Physical Distancing (n=3)				
Australia (Federal DOH)	1	7.0	87.5	80.0
Victoria	1	7.0	87.5	80.0
New Zealand	1	8.0	87.5	60.0
Masks (n=6)				
Australia (Federal DOH)	1	7.0	87.5	80.0
Victoria	3	7.0 [7-8]	87.5 (0.0)	60.0 (0.0)
New Zealand	2	9.0 [8-10]	87.5 (0.0)	60.0 (0.0)

Abbreviations: COVID-19, Coronavirus; DOH, Department of Health; CDC, Centres for Disease Control and Prevention; ECDC, European Centre for Disease Prevention and Control; WHO: World Health Organisation; SMOG; Simple Measure of Gobbledygook; IQR, interquartile range; PEMAT, Patient Education Assessment Tool.

*Readability scores for standard content were calculated separately for each webpage, while easy-read content and all PEMAT scores were calculated for each topic. [†] Median (IQR) [range] for readability presented when there was more than one webpage or easy read resource for each topic. # The 70% thresholds for understandability and actionability were established by the original authors of the PEMAT, though it has no empirical basis, it is a widely used benchmark.

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Appendix 1.

Website Selection

We purposively selected websites from three countries (Australia, New Zealand, and the United Kingdom), three Australian states (New South Wales, Queensland, and Victoria), and three international Public Health Agencies (Centres for Disease Control and Prevention (CDC), European Centre for Disease Prevention and Control (ECDC), and World Health Organization (WHO)). We had a focus on resources from Australia, with other sources selected to provide global comparisons. The three Australian states were selected based on number total number of COVID-19 cases as of April 2021. We also identified easy-read resources which have been developed by some jurisdictions. Easy-read resources are generally translated from the main content into ‘easy English’, and often have a specified audience for people with disability, elderly, or people that speak English as a second language. Multi-media formats were excluded.

Readability

We used the health literacy editor ‘Sydney Health Literacy Lab (SHeLL) Editor’ to calculate readability.¹ The SHeLL editor is an online real-time editor that provides automated feedback on text complexity. It uses the Simple Measure of Gobbledygook (SMOG) Index² to calculate readability in the form of grade reading level. The SMOG index uses an algorithm based on the number of polysyllabic words (≥ 3 syllables) in each sentence. It is considered best suited for health applications as it has been validated against 100% comprehension; people with an eighth-grade reading ability would score 100% on a multiple-choice comprehension test for text written at an eighth grade reading level. It is, therefore, less likely to underestimate the grade reading level to compared to other readability formulas, such as the Flesch Kinkaid Grade Level, which assumes 75% comprehension³.

We copied and pasted text from each webpage separately into the SHeLL editor. Text was prepared following best practice guidelines from health literacy experts. Any part of the text that was not written as a complete sentence (e.g., bullet points and headings with less than four words) was excluded from the readability calculation to avoid underestimating the grade reading level. However, bullet points and headings that were written as full sentences or phrases were included. We removed any colons or full stops that did not indicate the end of a sentence (e.g., U.S. would be changed to US) and removed any URLs. We reported the proportion that exceeded an 8th grade reading level.

Understandability and Actionability

We used the validated Patient Education Materials Assessment Tool (PEMAT)⁴ developed by the Agency for Healthcare Research and Quality to assess the understandability and actionability of COVID-19 information. The understandability domain consists of 17 items under 6 topic areas (content, word choice and style, use of numbers, organisation, layout and design, and use of visual aids), and measures the extent to which materials can be understood by consumers from diverse backgrounds and levels of health literacy. The actionability domain consists of 7 items and assesses how well consumers can use the information to take action. Each item is given a score of 0 (disagree) or 1 (agree), with some items having a not applicable (NA) option. Final scores are given as a percentage of all agree items for all items excluding those rated as not applicable. Higher scores indicate the material is easier to understand and act on, with scores of at least 70% considered

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adequate. Two evaluators with previous experience using the PEMAT scored the content independently, with any discrepancies resolved via discussion.

Analysis

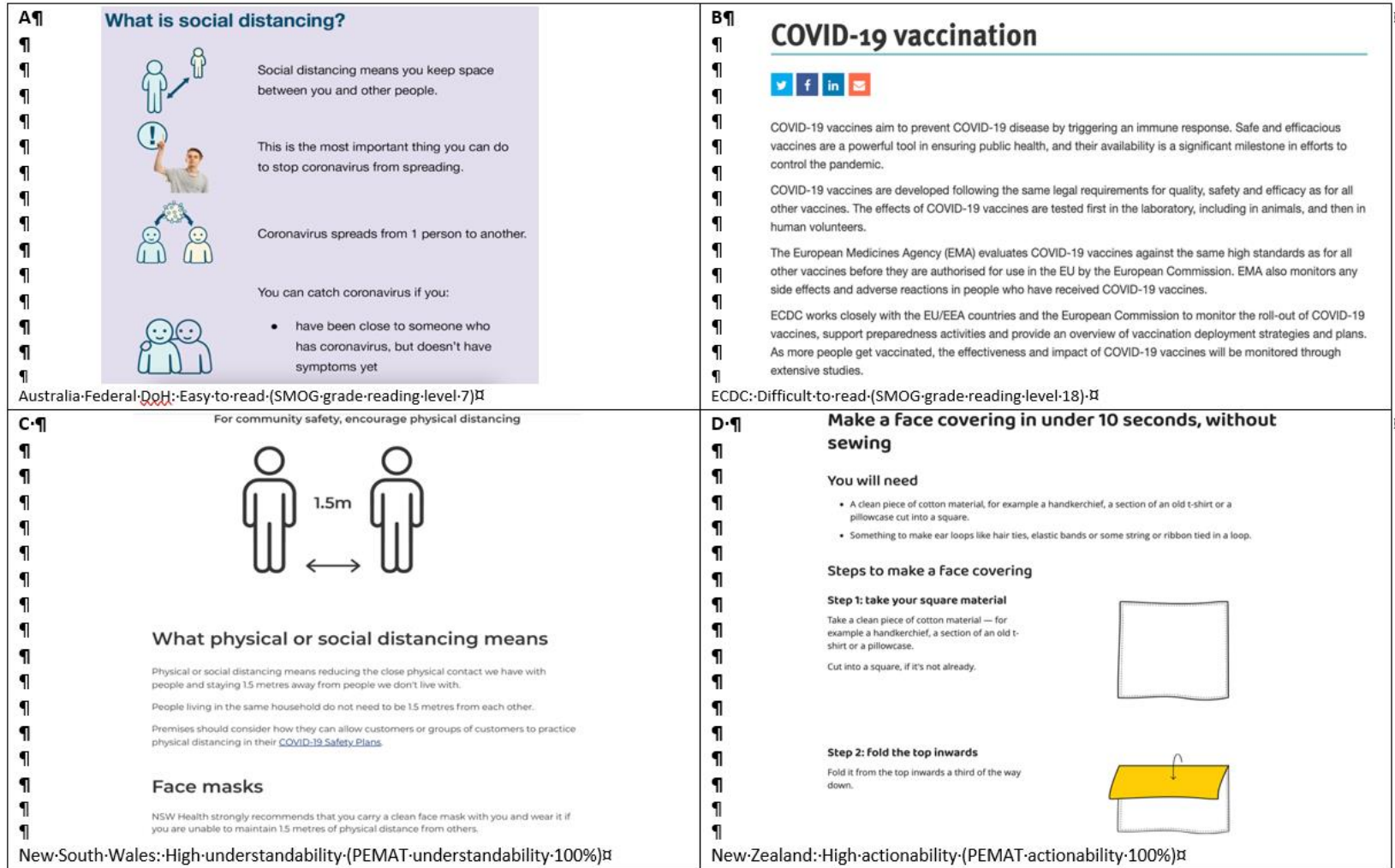
For the PEMAT assessment, we grouped all webpages for each topic together. This was because one page often linked to another page with additional information, and for each source, material was presented in a similar style. We assessed the readability of each webpage separately however, as the actual written content varied across the pages, and we wanted to fully capture the range of readability scores. As the easy-read resources were designed to be viewed as a standalone resource, we assessed both the readability and PEMAT separately for each PDF. We conducted analyses exploring adjusting for clustering (by jurisdiction), which had no impact on the medians or interquartile ranges, therefore have just reported the raw values.

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Results

Figure 1. Illustrative webpage examples. Panels A and B: easy-to-read and difficult-to-read respectively, based on Simple Measure of Gobbledygook (SMOG) grade-reading-level. Panels C and D: high-understandability and high-actionability respectively, based on Patient Education Materials Assessment Tool (PEMAT) scores.



DoH: Department of Health, SMOG: Simple Measure of Gobbledygook, ECDC: European Centre for Disease Prevention and Control, PEMAT: Patient Education Materials Assessment Tool