This is a repository copy of *Editorial: Artificial intelligence for human function and disability*.

White Rose Research Online URL for this paper:
https://eprints.whiterose.ac.uk/203209/

Version: Published Version

Article:
Newman-Griffis, D. orcid.org/0000-0002-0473-4226, Desmet, B., Zirikly, A. et al. (2 more authors) (2023) Editorial: Artificial intelligence for human function and disability. Frontiers in Digital Health, 5. 1282287. ISSN 2673-253X

https://doi.org/10.3389/fdgth.2023.1282287

Reuse
This article is distributed under the terms of the Creative Commons Attribution (CC BY) licence. This licence allows you to distribute, remix, tweak, and build upon the work, even commercially, as long as you credit the authors for the original work. More information and the full terms of the licence here: https://creativecommons.org/licenses/

Takedown
If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.

eprints@whiterose.ac.uk
https://eprints.whiterose.ac.uk/

frontiers | Frontiers in Digital Health

TYPE Editorial
PUBLISHED 08 September 2023
DOI 10.3389/fdgth.2023.1282287

Check for updates

OPEN ACCESS

EDITED AND REVIEWED BY
Uwe Aickelin,
The University of Melbourne, Australia

*CORRESPONDENCE
Denis R. Newman-Griffis
✉ d.r.newman-griffis@sheffield.ac.uk

RECEIVED 23 August 2023
ACCEPTED 24 August 2023
PUBLISHED 08 September 2023

CITATION
Newman-Griffis DR, Desmet B, Zirikly A, Tamang S and Chang C-H (2023) Editorial: Artificial intelligence for human function and disability.
Front. Digit. Health 5:1282287.
doi: 10.3389/fdgth.2023.1282287

COPYRIGHT
© 2023 Newman-Griffis, Desmet, Zirikly, Tamang and Chang. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

Editorial: Artificial intelligence for human function and disability

Denis R. Newman-Griffis[1,2]*, Bart Desmet[2], Ayah Zirikly[2,3], Suzanne Tamang[4] and Chih-Hung Chang[5,6,7]

[1]Information School, University of Sheffield, Sheffield, United Kingdom, [2]Rehabilitation Medicine Department, National Institutes of Health Clinical Center, Bethesda, MD, United States, [3]Center for Speech and Language Processing, Johns Hopkins University, Baltimore, MD, United States, [4]Division of Immunology and Rheumatology, Stanford University School of Medicine, Stanford, CA, United States, [5]Program in Occupational Therapy, Washington University School of Medicine, St. Louis, MO, United States, [6]Department of Medicine, Washington University School of Medicine, St. Louis, MO, United States, [7]Department of Orthopedic Surgery, Washington University School of Medicine, St. Louis, MO, United States

KEYWORDS

artificial intelligence, human function, disability, rehabilitation, natural language processing, ICF

Editorial on the Research Topic
Artificial intelligence for human function and disability

Disability is a near-universal experience, but one for which the transformative potential of health data and artificial intelligence (AI) remains relatively unexplored. The World Health Organization (WHO) estimates that more than one in six people around the world are disabled (1), and many more experience functional limitations associated with frailty, illness, or injury (2). Understanding people's functional outcomes, including impairments to body functions or structures, limitations in activities, and restricted opportunities to participate in society, is vital to capturing the lived experience of health and providing effective, patient-centered care (3, 4). Despite the outstanding global needs for information on function and disability, few studies have explored efficient and cost-effective strategies for bringing informatics and information science to bear on this essential aspect of human health and well-being.

This Research Topic aimed to bring together interdisciplinary perspectives from digital health and health informatics, data science and artificial intelligence, and rehabilitation science to explore the potential of AI technologies in achieving better use of information on human function and disability. AI technologies offer exciting potential for dealing with the significant information challenges posed by function and disability information, such as multiple data sources with diverse data elements and perspectives, data from inside and outside the clinic, and complex, hard-to-standardize data (5). The studies published in this Research Topic represent significant advances in mapping out this potential and charting paths forward for research on AI for function and disability.

The study by Kaelin et al. presents a scoping review of the uses of AI technologies in capturing and analyzing information on participation in the context of pediatric rehabilitation. Participation is notoriously difficult to define and measure, but understanding a patient's participation experiences is key to delivering care that is centered on their unique needs. Their analysis of 21 published studies shows that AI technologies have been explored as part of a variety of assessment methods in pediatric rehabilitation, primarily through *post hoc* analysis of recorded information using machine

learning (ML). The measurements analyzed varied widely, including clinical notes, physiological sensors, and face tracking. Their findings highlight clear needs for better reporting on sample characteristics in AI-based rehabilitation studies, the importance of integrating children's perspectives into use of AI in pediatric rehabilitation, the need to explore remote administration of AI-based assessment, and the lack of AI approaches that align with current definitions of participation.

The study by Divita et al. presents new natural language processing (NLP) methods for extracting information on body function from clinical text. Body function has not been systematically studied previously in health NLP research, and presents notable challenges for effective NLP as well as significant value for health professionals. They developed a practical and portable rule-based NLP system for extracting body function information, and tested it on a complex real-world dataset from the U.S. Social Security Administration. Their experiments show promising utility for body function extraction in real-world settings, and their analysis of system performance highlights key challenges for future NLP research on function information to address.

The study by Fan et al. moves outside the clinical setting to analyze consumer product reviews related to chronic pain, a common contributor to—and co-morbidity of—disability. Chronic pain affects more than one in five US adults and can contribute to significant functional limitations and participation restrictions. As a result, many people with chronic pain have developed a range of self-management strategies using over-the-counter and consumer goods, and reviews of these products in online marketplaces can provide an invaluable window into the lived experiences and functioning of people with chronic pain. The study's content analysis shows that online reviews reflect common comorbidities of chronic pain and use of literature-supported, evidence-based strategies for self-management, and further highlight the types of over-the-counter treatment sought and feedback on product efficacy. Their findings provide a valuable characterization of the information available in online reviews for understanding the experience of people with chronic pain, and lays the groundwork for future studies to use online reviews to help identify potential research gaps or therapeutic directions.

Finally, the study by Fu et al. addresses the question of how functional status is documented in current electronic health record systems across a range of healthcare institutions. In increasingly data-driven healthcare, the availability and quality of health information can be a key bottleneck or a major facilitator, particularly for delivering on the promise of learning health systems. Their study draws on the robust, multi-institution population of the Mayo Clinic Study of Aging, and employs a mixed methods approach to identify documentation strategies for functional status across participating healthcare institutions. Their analysis reveals important differences in quality, frequency, and depth of documentation, and illustrates the variation in language, content, and documentation context across different institutions. Their findings provide important insights for the ongoing development of NLP methodologies focused on function and disability, and support their call for ongoing quality assessment of clinical text as a key factor in delivering effective health information.

Together, these studies present valuable insights into the range of health information relevant to human function and disability, and into the role of AI technologies in helping to better collect, analyze, and report function and disability information. They demonstrate the opportunities and challenges in realizing the potential of AI technologies to help analyze and use information on function and disability, reflecting on essential applications of AI in tasks such as information extraction, classification, and prediction. They further illustrate ways in which AI methods, particularly in natural language processing, can help in working with information that is traditionally difficult to collect and standardize, as well as raising awareness of key risks and data quality issues that may limit the benefits of AI use. The work presented in this Research Topic builds on the AI4Function workshops that preceded it (6, 7) to map out important research directions for realizing the benefits of artificial intelligence technologies for human function and disability.

Author contributions

DN-G: Writing – original draft. BD: Writing – review and editing. AZ: Writing – review and editing. ST: Writing – review and editing. C-HC: Writing – review and editing.

Funding

The author(s) declare that no financial support was received for the research, authorship, and/or publication of this article.

Acknowledgments

We thank the authors of the papers submitted in this Research Topic for their valuable contributions and the referees for their rigorous review and thoughtful feedback. We also thank the editorial boards of Frontiers in Digital Health and Frontiers in Rehabilitation Sciences for supporting the topic, and the Frontiers specialists for their support throughout.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision.

Publisher's note

All claims expressed in this article are solely those of the authors and do not necessarily represent those of their affiliated organizations, or those of the publisher, the editors and the reviewers. Any product that may be evaluated in this article, or claim that may be made by its manufacturer, is not guaranteed or endorsed by the publisher.

References

1. World Health Organization, The World Bank. *World report on disability*. Geneva, Switzerland: World Health Organization (2011).

2. Cieza A, Causey K, Kamenov K, Hanson SW, Chatterji S, Vos T. Global estimates of the need for rehabilitation based on the global burden of disease study 2019: a systematic analysis for the global burden of disease study 2019. *Lancet*. (2020) 396 (10267):2006–17. doi: 10.1016/S0140-6736(20)32340-0

3. World Health Organization. *The international classification of functioning, disability and health: ICF*. Geneva, Switzerland: World Health Organization (2001).

4. American Geriatrics Society Expert Panel on Person-Centered Care, Brummel-Smith K, Butler D, Frieder M, Gibbs N, Henry M, Koons E, et al. Person-centered care: a definition and essential elements. *J Am Geriatr Soc*. (2016) 64(1):15–8. doi: 10.1111/jgs.13866

5. Newman-Griffis DR, Hurwitz MB, McKernan GP, Houtrow AJ, Dicianno BE. A roadmap to reduce information inequities in disability with digital health and natural language processing. *PLOS Digital Health*. (2022) 1(11):e0000135. doi: 10.1371/journal.pdig.0000135

6. Newman-Griffis D, Pakhomov SV, Tamang S, Zirikly A, Desmet B, Liu H, et al. *Proceedings of the first workshop on artificial intelligence for function, disability, and health* (2021).

7. Newman-Griffis D, Desmet B, Zirikly A, Tamang S, Liu H. *Proceedings of the second workshop on artificial intelligence for function, disability, and health* (2021).