

Systematic review

# Reporting of sex and/or gender in randomised controlled trials of physiotherapy interventions remains problematic: a systematic review



Emre Ilhan\*, Kathleen Solis, Cindy Liu, Jamal Khawaja,  
Tran Dang Khoa Chau, Kelly Gray

Department of Health Sciences, Faculty of Medicine, Health and Human Sciences, Macquarie University, Level 5, 75 Talavera Road, Sydney, Australia

## Abstract

**Background** Little is known about how sex and/or gender is reported in trials on physiotherapy interventions.

**Objectives** To determine the nature and extent of reporting sex and/or gender information in randomised controlled trials of physiotherapy interventions.

**Data sources** Physiotherapy, Journal of Physiotherapy, Physical Therapy, Brazilian Journal of Physical Therapy, and Journal of Orthopaedics and Sports Physical Therapy.

**Study selection or eligibility criteria** Randomised controlled trials of physiotherapy interventions published between 2018 and 2024 were independently screened by two reviewers throughout title/abstract and full-text stages, then data were extracted from eligible full texts. Information on whether and how sex and/or gender data were collected, reported, and defined were extracted.

**Synthesis methods** Data were analysed descriptively using frequencies and percentages.

**Results** Of 182 studies included in the review, 153 studies did not have sex and/or gender exclusive recruitment. Of these, 136 studies (89%) used the terms “sex” or “gender” when reporting demographic characteristics. Three studies used the term “sex assigned at birth”. When reporting sex and/or gender, 82/139 (59%) studies provided two descriptors for sex and/or gender (e.g., male and female; men and women), 39/139 (28%) studies provided one descriptor (e.g., female) despite not being sex and/or gender exclusive. Four studies provided more than 2 descriptors (e.g., transgender women). In all studies, it was unclear how sex and/or gender was defined. In all but three studies, it was unclear how sex and/or gender was collected and whether data collection methods allowed for gender diverse options (e.g., non-binary) to be selected.

**Limitations** Only 5 journals were surveyed.

**Conclusions and implications of key findings** The lack of inclusive reporting of gender and/or sex characteristics limits the scope and applicability of research in physiotherapy to the full spectrum of human experiences.

**PROSPERO Registration** CRD42022383976.

## Contribution of the Paper

- Researchers should refer to up-to-date reporting guidelines when designing, collecting, and reporting sex and/or gender-based analyses.
- Researchers should engage in sex and gender inclusive research practices when conducting and reporting physiotherapy research.

© 2024 The Authors. Published by Elsevier Ltd on behalf of Chartered Society of Physiotherapy. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

**Keywords:** Sex; Gender identity; Reporting; Physiotherapy; Randomised controlled trials

\* Corresponding author.

*E-mail addresses:* [emre.ilhan@mq.edu.au](mailto:emre.ilhan@mq.edu.au) (E. Ilhan), [kathleen.solis@students.mq.edu.au](mailto:kathleen.solis@students.mq.edu.au) (K. Solis), [cindy.liu1@students.mq.edu.au](mailto:cindy.liu1@students.mq.edu.au) (C. Liu), [jamal.khawaja@students.mq.edu.au](mailto:jamal.khawaja@students.mq.edu.au) (J. Khawaja), [tran.chau@students.mq.edu.au](mailto:tran.chau@students.mq.edu.au) (T.D.K. Chau), [kelly.gray@mq.edu.au](mailto:kelly.gray@mq.edu.au) (K. Gray).

<https://doi.org/10.1016/j.physio.2024.101450>

0031-9406/© 2024 The Authors. Published by Elsevier Ltd on behalf of Chartered Society of Physiotherapy. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

## Introduction

Sex and gender identity,<sup>1</sup> which are independent constructs, can have direct and indirect effects on a person's health and consequently lead to disparate outcomes if unaddressed [1]. Sex refers to the biological features related to chromosomes, secondary sexual characteristics, gene expression, hormone function, and reproductive anatomy [2–4]. Sex is assigned at birth based on external genitalia and is often erroneously centred on the male-female binary but should also include intersex, which include a wide range of variations in sex-related biological features [4]. Indeed, the biological features of sex are not always correlated to being “male” or “female”, and may vary over time (e.g., reproductive anatomy) [4]. Gender identity, in contrast, refers to socially constructed roles, behaviours, and identities [2,4], and may be the same as the sex a person is assigned at birth (i.e., cisgender) or different to the sex assigned at birth (i.e., transgender, gender diverse). Although the construct “sex” is framed as biological, it is not socially inert; assumptions of sex based on external features are imbued with social expectations and practices [4]. People who identify as gender diverse (e.g., non-binary) may or may not identify with the sex they were assigned at birth. There are many other gender diverse identities including genderqueer, genderfluid, and agender [4]. Consequently, the spectrum of gender identities is diverse, and are not always related to sex assigned at birth [5]. The assumption that everyone identifies with the sex they were assigned at birth is referred to as cisnormativity. The distinction between sex and gender identity emphasises the need to consider these constructs when reporting research in physiotherapy.

Population-based surveys of adults estimate a prevalence of people who identify as gender diverse of up to 4.6% [6], individuals who are transgender of up to 871 per 100,000 population [7], and individuals who are intersex may account for up to 2% of the population [8]. In Australia, 2.3% of adolescents between 14 and 18 years of age are transgender or gender diverse [9]. These numbers are likely to be underestimated due to the lack of population-level inclusive data collection methods [10,11]. Non-inclusive data collection may reflect the ongoing discrimination of individuals who are transgender, gender diverse, or intersex [12]. The lack of inclusive research practices also has implications for estimating the true distribution of transgender and cisgender men and women, and people who are gender diverse.

The role of sex and gender in health is well-known (e.g., in stroke [13]), which can be partly explained by

differences in access to, utilisation and experience of healthcare. Socially relevant factors pertaining to sex and/or gender (e.g., gender bias in the treatment of pain [14]) influence the risk of disease and prognosis [1], and may contribute to ongoing disparities in health. Experiences of cisgender bias are particularly harmful to individuals who are transgender, gender diverse, or intersex who often report discomfort and discrimination when receiving physiotherapy care [15].

Consideration of the spectrum of sex and gender identities, through the use of accepted conceptualisations and terminologies, is critical in adequately addressing the associated inequities in health, and improve the care of people receiving physiotherapy [4]. Given the growing understanding of sex and gender identity and the pervasive bias towards cisgender men in health research [16], it is possible that a cisnormativity and an endonormativity lens has shaped physiotherapy interventional research. Endonormativity is the assumption that everyone has either a typical “female” or “male” body (i.e., endosex), and anyone outside of this normative binary (i.e., anyone who is intersex) is abnormal.

One way in which cisnormativity can be challenged is through the use of widely available reporting guidelines, which help researchers report their findings in a transparent way. The *Sex And Gender Equity in Research* (SAGER) guidelines [2], published in 2016, recommend that researchers not only report data disaggregated by sex and/or gender, where appropriate, but also outline how they collected sex and/or gender data, what options were provided to participants to self-select sex and gender, how researchers defined sex and/or gender, and the rationale for conducting or not conducting sex and/or gender-based analyses. A detailed checklist of the SAGER recommendations was developed in 2022 [17].

Therefore, based on the SAGER recommendations [2,17], this review aimed to determine the extent and nature of reporting of information on sex and/or gender in randomised controlled trials of physiotherapy interventions published in physiotherapy-specific journals.

## Methods

This systematic review was part of a larger project exploring the reporting of socially stratifying factors of health in physiotherapy research. The protocol for this review was prospectively registered on PROSPERO (CRD42022383976). The other factors will be presented in future publications arising from this review. The Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guideline were used in reporting this review.

### Identification and search of studies

Five physiotherapy-specific journals were selected on the basis of rank, impact factor, and the type of studies that

<sup>1</sup> The conceptualisation of sex and gender presented here is one based on literature from English-speaking Western countries and are not cross-cultural. There exist more complex and nuanced conceptualisations beyond the Western and colonial one that have existed and continue to exist in other cultures. For example, the Indigenous community in Australia have two additional gender identities that does not have a Western equivalent, which is *sistergirl* and *brotherboy*.

were published [18]. These included, in no particular order, *Journal of Physiotherapy*, *Physical Therapy*, *Journal of Orthopaedics and Sports Physical Therapy*, *Brazilian Journal of Physical Therapy*, and *Physiotherapy*.

#### *Eligibility criteria*

Randomised controlled trials involving human participants who underwent any type of physiotherapy intervention were included in this review. Trials published between 2018 and 2022 inclusive were included in the review. The search was updated on 21st September 2024. This time period was chosen to allow adequate time for researchers to implement the recommendations from the SAGER guidelines [2].

#### *Study screening and selection*

Studies were exported into *EndNote Version X9* (Clarivate Analytics, PA, USA) then imported to *Covidence Systematic Review Software* (Veritas Health Innovation, Melbourne, Australia) for de-duplication and screening. Two reviewers independently screened studies at the title, abstract, and full-text stage based on the eligibility criteria. A third reviewer was available to resolve disagreements.

#### *Data extraction process and data items*

Data from eligible studies were extracted independently by two reviewers and cross-checked for accuracy. Disagreements in data extraction were resolved by a third reviewer. A pro-forma developed prospectively in Covidence was used to input all extracted data. Data items that were extracted included study characteristics (e.g., country, year of publication, journal, eligibility criteria related to sex and/or gender), intervention characteristics (e.g., broad area of physiotherapy addressed), sample characteristics (e.g., sample size), and recruitment methods (e.g., whether equitable recruitment approaches were used). Regarding the variables of interest, data items that were extracted included if sex and/or gender data were collected and/or reported, how the data were collected (e.g., self-selected option or ability to self-describe) and/or reported (e.g., the descriptors used, such as “female”, “male”, “women”, etc), whether sex and/or gender data were analysed, whether studies provided sex and/or gender disaggregated outcome data, and whether sex and/or gender was defined.

#### *Synthesis methods*

Data were analysed descriptively using frequencies and percentages and organised according to the descriptors (e.g., female) of sex and/or gender used within studies. Further subgroup analyses based on year of publication, country of recruitment, and the area of physiotherapy in

which the intervention targeted (e.g., musculoskeletal, cardiorespiratory, neurology, etc) were planned. We indicated authors’ terminology when referring to information on sex and/or gender in their publications verbatim by using double quotation marks (e.g., “women”).

## **Results**

#### *Flow of studies through the review*

Following screening of 911 articles for eligibility, 182 articles were included in the review (Fig. 1): *Journal of Physiotherapy* (49/182, 27%), *Brazilian Journal of Physical Therapy* (36/182, 20%), *Physiotherapy* (35/182, 19%), *Journal of Orthopaedics and Sports Physical Therapy* (36/182, 20%), then *Physical Therapy* (26/182, 14%).

#### *Study characteristics*

Studies were conducted across 25 countries (Table 1), the majority of which were in Europe (52/182, 29%) and Brazil (48/182, 26%). Most studies were published in 2019 (31/182, 17%), and addressed musculoskeletal health (110/182, 60%). The total number of participants was 22,953, with a median sample size of 75 participants (range: 10 to 2313). Most interventions targeted musculoskeletal pain conditions ( $n = 85/182$ , 47%) such as non-specific chronic low back pain.

#### *Eligibility by sex and/or gender*

Twenty-seven studies (27/182, 15%) mentioned sex and/or gender in their eligibility criteria. Two studies stated that people of “both” genders were able to participate and four studies stated that people of “both” sexes could participate. It was unclear whether people who did not identify with a binary categorisation were eligible given the specific descriptors utilised in the eligibility criteria. One study invited individuals to participate “regardless of sex” and one study stated that “no exclusion was made due to gender”.

#### *Recruitment by sex and/or gender*

Twenty-nine studies (29/182, 16%) recruited participants based on sex and/or gender. Twenty-six studies (26/182, 14%) invited only “women” and “females” to be included in their studies, while three studies (3/182, 1.6%) invited only “men” and “males”. It was not clear whether exclusion was based on sex or gender, and no reason was provided in any of the sex and/or gender exclusive studies as to why individuals who were transgender or gender diverse could not be included. No studies reported strategies to ensure inclusive and equitable recruitment.

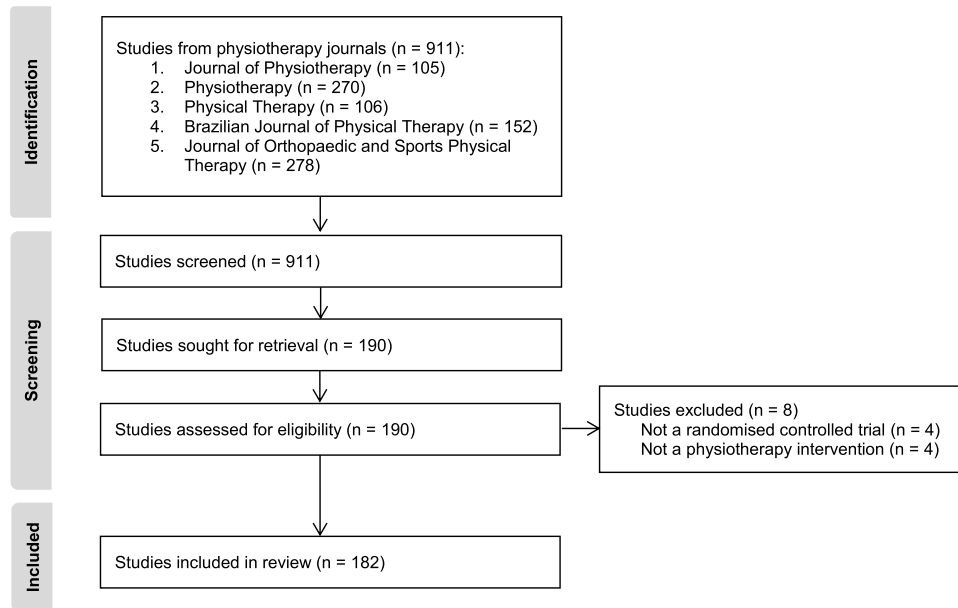


Fig. 1. Flow of studies through the review.

Table 1  
Characteristics of studies included in the review ( $N = 182$ ).

	<i>N</i> (%)
<b>Countries in which the trial was conducted</b>	
Europe	52 (29)
Brazil	48 (26)
Oceania	40 (22)
North America	23 (13)
Asia	9 (5)
Middle East	4 (2)
Africa	4 (2)
Australia and United States of America	1 (0.1)
South America (Other)	1 (0.1)
<b>Year of publication</b>	
2018	24 (13)
2019	31 (17)
2020	27 (15)
2021	25 (14)
2022	21 (12)
2023	26 (14)
2024	28 (15)
<b>Subdiscipline of physiotherapy</b>	
Musculoskeletal	110 (60)
Continence and women's health	22 (12)
Neurology	14 (8)
Cardiothoracics	13 (7)
Oncology	5 (3)
Orthopaedics	6 (3)
Gerontology	7 (4)
Paediatrics	2 (1)
Sports	2 (1)
Ergonomics and occupational health	1 (1)

### Randomisation by sex and/or gender

Two studies randomised participants stratified by “gender” however did not stipulate how, and one study stratified by “gender” however stipulated that this was by “men” and “women” only. Three studies stratified by sex, specifically by “males” and “females”. Two studies stratified by sex but did not state how.

### Reporting of “sex” or “gender” as a demographic variable

Of the 153 studies that did not have sex and/or gender exclusive recruitment, ten studies (10/153, 7%) did not report demographic data on sex and/or gender. In four studies (4/153, 3%), the descriptors “men, women” and “females” were used, however it was unclear whether this was related to the construct of sex or gender.

The term “sex” was reported in 77/139 (55%) studies, and the term “sex assigned at birth” was reported in 3/139 (2%) studies (Fig. 2). Of these, 26 studies provided demographic data for only the descriptor “female”, 10 studies provided demographic data for only the descriptor “male”, three studies provided demographic data for only the descriptor “women”, six studies provided demographic data for only the descriptor “men and women”, and 35 studies provided demographic data for only the descriptor “males and females”.

The term “gender” was reported in 60/139 (43%) studies (Fig. 2). Descriptors used for gender included “male and

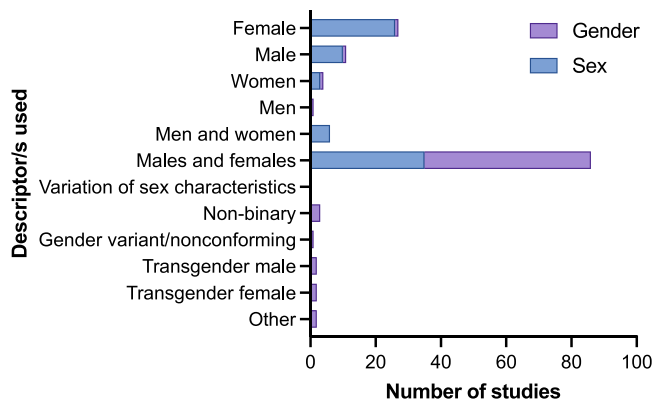


Fig. 2. Number of studies using each descriptor when referring to sex and gender.  $N = 137$  studies are represented in this graph; 57 studies reported on gender, and 77 reported on sex, and 3 reported on sex assigned at birth. It was unclear in one study what descriptor was being used, and in two studies no descriptor was provided. These three studies are not represented in the graph above.

female” in 51 studies, “female” only in one study, “women” only in one study, “male” only in one study, “men” only in one study, and it was unclear in one study. In addition to “males and females”, three studies used “non-binary”, and two studies used “transgender male, transgender female, gender variant/non-conforming”. Two studies used “other” as a category but did not specify what this referred to. Two studies did not use any descriptor for the construct of gender.

#### *Definitions of sex and/or gender and how information on sex and/or gender was collected*

Definitions of sex and/or gender were not provided by any study. Eight studies reported that they collected information on gender and/or sex through medical records, whereas all other studies collected this through participant self-report. All studies did not outline how participants were asked to provide information about their sex and/or gender, except two studies which provided the following options in their questionnaires: male, female, transgender male, transgender female, gender variant/non-conforming/non-binary and other. Besides these two studies, there was an overall lack of data around how information related to sex and/or gender were collected and how these constructs were defined by the researchers. Therefore, it was not possible to determine the distribution of the samples based on sex and/or gender.

#### *Analyses based on sex and/or gender*

Fourteen studies (14/153, 9%) analysed outcome data based on sex and/or gender. Only two studies (2/153, 1%) reported disaggregated outcome data by sex (i.e., males and females). Five studies reported analysis of their outcome

data by sex. Fifteen studies (15/153, 10%) adjusted their statistical models by sex ( $n = 13$ ) and/or gender ( $n = 2$ ) as a covariate, whereas three studies compared outcome data by sex (i.e., males and females only).

Of the studies that did not report on sex and/or gender-based outcome data ( $n = 139$ ), only four studies (4/139, 3%) indicated that potential, unexplored sex and/or gender biases may have existed in their samples that warranted further investigation.

#### *Subgroup analyses*

There was a lack of data around whether sex and/or gender was analysed in the studies included in this review, precluding subgroup analyses.

## **Discussion**

The reporting of sex and/or gender in randomised controlled trials in physiotherapy-specific journals remains inconsistent despite journal-specific guidelines addressing the need for clarity when reporting sex and/or gender. This may render assumptions of the sample distribution and analyses based on sex and/or gender unclear and problematic. Physiotherapy interventional research published in these journals reinforce a sex and/or gender binary. Not reporting data from individuals who are gender diverse, or intersex further marginalises and excludes these individuals from physiotherapy research. Ongoing social marginalisation and exclusion from research have negative consequences for the health and wellbeing of people outside of the gender and sex binary.

Our findings are similar to a review by Chalmers and Elkins [19] who surveyed a random sample of 250 randomised controlled trials in physiotherapy published in 2019 only. While a greater proportion of studies in our review used the term “sex” (55%) compared to the review by Chalmers and Elkins [19] (5%) and marginally more studies used the term “gender” (43%), no study used the terms “sex” and “gender” interchangeably in our review. Descriptors of sex and/or gender were unreliably correlated to the constructs of sex and/or gender. For example, studies reporting sex and gender used “female” or “male”. Therefore, these terms cannot be reliably used or interpreted as descriptors for the construct of sex and/or gender alone. In addition, given that sex and/or gender was not defined in the studies included in both this review, and the review by Chalmers and Elkins [19], caution should be exercised when interpreting whether the findings of these studies are actually related to the construct of sex characteristics or gender identity.

Inconsistent reporting also highlights potential issues regarding inclusive and equitable recruitment of individuals who identify as gender diverse (e.g., non-binary, gender-

fluid), particularly in sex and/or gender-exclusive research (e.g., studies investigating “women’s” health). Given the estimated global population of people who are transgender, gender diverse, and intersex, then there is an expectation that at least one participant would not have identified in the sex and/or gender binary; however, the inclusion of gender diverse, transgender, or intersex individuals was unclear in all but three studies. Furthermore, it was unclear whether, during data collection of demographic characteristics, participants were given the option to self-select one or more options when asked about gender, or a gender diverse option.

Stigma and discrimination experienced by people who identify as gender diverse [15], transgender [15], or intersex [20], may result in interested participants self-excluding from research. Self-exclusion may occur due to a lack of ability to self-identify their sex and/or gender, or non-inclusive advertising material (e.g., inviting people of “both sexes”). If included, it remains unknown if they were provided with the opportunity to self-identify their sex and/or gender identity to researchers. The current lack of reporting of sex and gender highlight the potential issue of missingness of data across the gender and sex spectrum and potential inherent biases in the way such data is collected, reported, and interpreted [12].

The majority of studies in this review addressed interventions for musculoskeletal pain. While epidemiological research on musculoskeletal pain confirms higher prevalence rates of musculoskeletal pain among women [21], it remains unclear whether prevalence differs by sex characteristics or gender identity. Quantitative sensory testing in cisgender and transgender women have demonstrated similar higher levels of pain sensitivity compared to cisgender men [22]. Strath *et al.* [22] argue that similar demonstration of temporal summation in transgender women as cisgender women highlight similarly increased risk of the development of chronic pain based on gender identity rather than sex characteristics. Furthermore, gender roles also play a substantial role in perceived and experimental pain perception [23]. Individuals who identified highly with their gender tended to conform to gendered social expectations of pain tolerance, compared to those who conformed less with social expectations [23]. Moreover, social expectations of pain tolerance was directly related to actual pain tolerance [23].

The role of gender identity and sex on treatment outcomes in physiotherapy remains to be elucidated. The lack of reported data on sex and/or gender information found in this review, limited the ability to determine the true distribution of samples based on sex and/or gender and to explore the modifying effect of sex and/or gender. Given the social impact of gender identity, and the potential interaction between gender identity and health [24], such an analysis may have important clinical implications including

the potential impact these constructs may have on physiotherapy outcomes.

There remains an ongoing conflation of the terms sex and/or gender. Consequently, there is a need for health research to elucidate the differential impact of biological systems and gendered experiences on health outcomes [4]. That is, while health disparities as a result of sex may arise due to biological processes (e.g., genetic, hormonal, physiological factors), disparities due to gender may arise due to oppressive systems of power and discrimination (e.g., patriarchy, misogyny, transphobia, interphobia) and normed patterns of behaviour that lead to differences in access to, utilisation and experience of health care [4]. The findings from this review also highlight a paucity of evidence of health interventions that is generalisable to people who identify as transgender, gender diverse, or intersex.

Several recommendations can be made from the findings of this study. Future physiotherapy research should ensure gender and sex-inclusive recruitment, data collection and reporting to enable the exploration of sex and gender-specific differences in health outcomes. Reference to published reporting guidelines such as SAGER [2,17] and up-to-date recommended data collection formats [25] may enable more inclusive data collection and reporting practices in physiotherapy. Specifically, trial protocols should allow for the comprehensive collection of data related to gender and/or sex characteristics, allowing individuals to self-identify beyond binary options. Importantly, if the sex characteristics of participants is the variable of interest, researchers should provide an explicit a priori rationale for asking and reporting this e.g., to explore clearly hypothesised sex-specific differences in health outcomes following certain interventions.

Researchers should also proactively design strategies to enable the recruitment of individuals with diverse gender identities and sex characteristics. Strategies may include reaching out to historically under-represented groups to ensure that trial samples are representative of the spectrum of gender and sex characteristics in the population of interest. There is an urgent need to train researchers and clinicians about recognising and addressing the lack of diversity of gender and sex characteristics in physiotherapy clinical research. Such training should involve considering the full spectrum of gender and sex characteristics at all stages of the research process, from study design to clinical application to patients to ensure the generalisability of findings to all patients. Finally, there is an ongoing need for advocacy in changing policies in professional organisations, funding agencies, and journals to mandate the inclusion of diverse gender identities and sex characteristics in research. Such policies should require researchers to report on the diversity of their samples and include analysis based on these factors, ensuring that research findings are relevant and applicable to all populations.

It is important to note that efforts for inclusive research practices extend beyond sex and/or gender. Health disparities related to sex and/or gender are compounded by other intersecting social realities, including being queer, socio-economically disadvantaged, lacking social capital, and being racialized in a non-dominant group. Therefore, researchers must consider ways to ensure that individuals from other marginalised groups are provided with the opportunity to be a part of and benefit from the outcomes of research.

This review may be limited in its generalisability. We only explored randomised controlled trials that were published between 2018 and 2024 in five physiotherapy journals. This might have under or over-estimated the level of reporting of sex and/or gender information in trials relevant to physiotherapy, which may have been published in multi-disciplinary healthcare journals. Additionally, we did not consider other study designs which may or may not have had inclusive research practices.

The reporting of sex and/or gender in published randomised controlled trials of physiotherapy is ambiguous, and frames sex and/or gender as binary and interchangeable constructs. This is problematic in terms of the interpretation of randomised controlled trials in relation to sex and/or gender and also whether findings are generalisable to people who identify as gender diverse, transgender, or intersex. Our findings provide evidence that physiotherapy research may not be inclusive and does not practice equitable recruitment of people who are gender diverse, transgender, or intersex. Given the health-modifying role that gender identity plays in health, it is important to ensure the use of consistent and accepted local terminology of sex and/or gender when collecting, reporting, and analysing data in randomised controlled trials in physiotherapy.

**Ethical approval:** This study did not require ethical approval.

**Funding:** This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

#### Declarations of interest

None.

#### Acknowledgements

We would like to thank the editor and reviewers for providing critical feedback that enhanced the manuscript.

#### References

- [1] Johnson JL, Greaves L, Repta R. Better science with sex and gender: facilitating the use of a sex and gender-based analysis in health research. *Int J Equity Health* 2009;8(1):14. <https://doi.org/10.1186/1475-9276-8-14>
- [2] Heidari S, Babor TF, De Castro P, Tort S, Curno M. Sex and gender equity in research: rationale for the SAGER guidelines and recommended use. *Res Integr Peer Rev* 2016;1:2. <https://doi.org/10.1186/s41073-016-0007-6>
- [3] Zagrosek V. Sex and gender differences in health. *EMBO Rep* 2012;13(7):596–603. <https://doi.org/10.1038/embor.2012.87>
- [4] Rioux C, Paré A, London-Nadeau K, Juster RP, Weedon S, Levasseur-Puhach S, et al. Sex and gender terminology: a glossary for gender-inclusive epidemiology. *J Epidemiol Community Health* 2022. <https://doi.org/10.1136/jech-2022-219171>
- [5] A Gender Agenda. A guide to LGBTIQ-inclusive data collection; 2023. (<https://genderrights.org.au/wp-content/uploads/2020/03/LGBTIQ-Inclusive-Data-Collection-a-Guide.pdf>). [Accessed 23 October 2022].
- [6] Kuyper L, Wijzen C. Gender identities and gender dysphoria in the Netherlands. *Arch Sex Behav* 2014;43(2):377–85. <https://doi.org/10.1007/s10508-013-0140-y>
- [7] Collin L, Reisner SL, Tangpricha V, Goodman M. Prevalence of transgender depends on the "case" definition: a systematic review. *J Sex Med* 2016;13(4):613–26. <https://doi.org/10.1016/j.jsxm.2016.02.001>
- [8] Blackless M, Charuvastra A, Derryck A, Fausto-Sterling A, Lauzanne K, Lee E. How sexually dimorphic are we? Review and synthesis. *Am J Hum Biol* 2000;12(2):151–66. [https://doi.org/10.1002/\(SICI\)1520-6300\(200003/04\)12:23.O.CO;2-F](https://doi.org/10.1002/(SICI)1520-6300(200003/04)12:23.O.CO;2-F)
- [9] Fisher CM, Waling A, Kerr L, Bellamy R, Ezer P, Mikolajczak G, et al. 6th national survey of Australian secondary students and sexual health 2018. Bundoora: Australian Research Centre in Sex, Health & Society, La Trobe University; 2019.
- [10] Lyons A, Rasmussen ML, Anderson J, Gray E. Counting gender and sexual identity in the Australian census. *Aust Pop Stud* 2021;5(1):40–8. <https://doi.org/10.37970/aps.v5i1.80>
- [11] Ackley SF, Zimmerman SC, Flatt JD, Riley AR, Sevelius J, Duchowny KA. Discordance in chromosomal and self-reported sex in the UK biobank: implications for transgender- and intersex-inclusive data collection. *Proc Natl Acad Sci USA* 2023;120(18):e2218700120. <https://doi.org/10.1073/pnas.2218700120>
- [12] Weber AM, Gupta R, Abdalla S, Cislighi B, Meausoone V, Darmstadt GL. Gender-related data missingness, imbalance and bias in global health surveys. *BMJ Glob Health* 2021;6(11). <https://doi.org/10.1136/bmjgh-2021-007405>
- [13] Rexrode KM, Madsen TE, Yu AYY, Carcel C, Lichtman JH, Miller EC. The impact of sex and gender on stroke. *Circ Res* 2022;130(4):512–28. <https://doi.org/10.1161/CIRCRESAHA.121.319915>
- [14] Hoffmann DE, Tarzian AJ. The girl who cried pain: a bias against women in the treatment of pain. *J Law Med Ethics* 2001;29(1):13–27. <https://doi.org/10.1111/j.1748-720x.2001.tb00037.x>
- [15] Ross MH, Setchell J. People who identify as LGBTIQ+ can experience assumptions, discomfort, some discrimination, and a lack of knowledge while attending physiotherapy: a survey. *J Physiother* 2019;65(2):99–105. <https://doi.org/10.1016/j.jphys.2019.02.002>
- [16] Perez C. *Invisible women: exposing data bias in a world designed for men*. Great Britain, GB: Random House; 2019.
- [17] van Epps H, Astudillo O, dPM Y, Marsh J. The sex and gender equity in research (SAGER) guidelines: implementation and checklist development. *Eur Sci Ed* 2022;48:e86910. <https://doi.org/10.3897/ese.2022.e86910>

- [18] Costa LO, Moseley AM, Sherrington C, Maher CG, Herbert RD, Elkins MR. Core journals that publish clinical trials of physical therapy interventions. *Phys Ther* 2010;90(11):1631–40. <https://doi.org/10.2522/ptj.20090419>
- [19] Chalmers KJ, Elkins MR. Sex and gender in physiotherapy research. *J Physiother* 2021;67(4):238–9. <https://doi.org/10.1016/j.jphys.2021.08.015>
- [20] Carpenter M. Intersex human rights, sexual orientation, gender identity, sex characteristics and the Yogyakarta Principles plus 10. *Cult Health Sex* 2021;23(4):516–32. <https://doi.org/10.1080/13691058.2020.1781262>
- [21] Wijnhoven HA, de Vet HC, Picavet HS. Prevalence of musculoskeletal disorders is systematically higher in women than in men. *Clin J Pain* 2006;22(8):717–24. <https://doi.org/10.1097/01.ajp.0000210912.95664.53>
- [22] Strath LJ, Sorge RE, Owens MA, Gonzalez CE, Okunbor JI, White DM, et al. Sex and gender are not the same: why identity is important for people living with HIV and chronic pain. *J Pain Res* 2020;13:829–35. <https://doi.org/10.2147/JPR.S248424>
- [23] Pool GJ, Schwegler AF, Theodore BR, Fuchs PN. Role of gender norms and group identification on hypothetical and experimental pain tolerance. *Pain* 2007;129(1–2):122–9. <https://doi.org/10.1016/j.pain.2006.10.008>
- [24] Welch V, Doull M, Yoganathan M, Jull J, Boscoe M, Coen SE, et al. Reporting of sex and gender in randomized controlled trials in Canada: a cross-sectional methods study. *Res Integr Peer Rev* 2017;2:15. <https://doi.org/10.1186/s41073-017-0039-6>
- [25] ACON. Policy and research: ACON health; 2023. (<https://www.acon.org.au/what-we-are-here-for/policy-research/#recommended-sexuality-and-gender-indicators>). [Accessed 05 May 2023].

Available online at [www.sciencedirect.com](http://www.sciencedirect.com)

**ScienceDirect**