



OPEN ACCESS

EDITED BY

Berta Paz-Lourido,
University of the Balearic Islands, Spain

REVIEWED BY

Carlos Miguel Rios-González,
Ministerio de Salud Pública y Bienestar Social,
Paraguay
Tobba Sudmann,
Western Norway University of Applied
Sciences, Norway

*CORRESPONDENCE

Emma Swärdh
✉ emma.swardh@ki.se

RECEIVED 11 October 2024

ACCEPTED 30 November 2024

PUBLISHED 16 December 2024

CITATION

Swärdh E, Brodin N, Palstam A and
Petterson A (2024) High consciousness—low
application: sustainable development and
sustainable healthcare in undergraduate
physiotherapy education in Sweden.
Front. Public Health 12:1509997.
doi: 10.3389/fpubh.2024.1509997

COPYRIGHT

© 2024 Swärdh, Brodin, Palstam and
Petterson. This is an open-access article
distributed under the terms of the [Creative Commons Attribution License \(CC BY\)](https://creativecommons.org/licenses/by/4.0/). 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.

High consciousness—low application: sustainable development and sustainable healthcare in undergraduate physiotherapy education in Sweden

Emma Swärdh^{1*}, Nina Brodin^{1,2}, Annie Palstam^{3,4} and
Anna Petterson¹

¹Division of Physiotherapy, Department of Neurobiology, Care Sciences and Society, Karolinska Institutet, Huddinge, Sweden, ²Division of Physiotherapy, Department of Orthopaedics, Danderyd Hospital, Stockholm, Sweden, ³School of Health and Welfare, Dalarna University, Falun, Sweden, ⁴Department of Clinical Neuroscience, Institute of Neuroscience and Physiology, Sahlgrenska Academy, University of Gothenburg, Gothenburg, Sweden

Background: Swedish undergraduate physiotherapy education lacks comprehensive integration of sustainable development in curricula. Factors related to educators' perspectives in preparing future physiotherapists for sustainable development and sustainable healthcare may shed light on this shortcoming.

Aim: This study aims to describe Swedish physiotherapy educators' (i) consciousness of sustainable development and its inclusion in teaching and learning activities, (ii) ecological worldviews, (iii) attitudes toward sustainability and climate change in physiotherapy, (iv) perceptions of education for sustainable development and sustainable healthcare and (v) examine the relationship between ecological worldview and attitudes toward sustainability and climate change in physiotherapy.

Method: A cross-sectional, descriptive study was performed using a digital survey to collect data from educators within undergraduate physiotherapy education at five higher education institutions in Sweden. Data was collected using the Sustainability Consciousness Questionnaire, the New Ecological Paradigm Scale, the Sustainability Attitudes in Nursing Survey 2, and questions related to knowledge, attitudes, and self-efficacy for education for sustainable development and sustainable healthcare.

Result: Most, but not all, of the 72 educators, (76%) were aware of Agenda 2030 and the sustainable development goals, and 17% included perspectives related to sustainable development in teaching and learning activities. The educators endorsed an eco-centered ecological worldview and had largely positive overall attitudes toward sustainability and climate change within physiotherapy. However, almost one-third (28%) disagreed that issues about climate change should be included in the physiotherapy curriculum. Most agreed about having content knowledge on climate and health (81%), while a smaller part agreed on having pedagogical content knowledge regarding how to inspire or educate for sustainable development (17–28%). There was also a wide variation in perceived self-efficacy in education for sustainable development and sustainable healthcare.

Conclusion: Despite the endorsement of eco-centered ecological worldviews and a rather high consciousness of sustainable development as an overall concept, there remains a disconnect to educational attitudes and actions among Swedish physiotherapy educators. This points to the need to explore the narrative of sustainable development within physiotherapy in Sweden rooted in broader concept understanding, ethics, and reflective practice for sustainable development. A key priority should be to offer new perspectives on professional identity and continuing professional development within sustainable development.

KEYWORDS

survey, educators, higher education, new ecological paradigm scale, sustainability consciousness questionnaire, sustainability attitudes

Introduction

Sustainable development is essential for the well-being of both current society and future generations. To address the global challenges and foster resilient, thriving societies, the United Nations' Agenda 2030 and its sustainable development goals underscore the interconnectedness of economic growth, social inclusion, and environmental stewardship (1–3). Further, the nested dependency model of sustainable development (4) highlights the environment as the fundamental base supporting human society and economic systems. The concept of planetary boundaries (5) reinforces the environmental limits within which human development must operate. Consistent with this perspective, it is crucial to emphasize that environmental sustainability issues have become an urgent global health concern (6–10). The adverse health effects associated with negative exposure to environmental determinants of health place increasingly high demands on health care (11). At the same time, healthcare services in itself have a role in further contributing to negative health effects by generating emissions that lead to climate change and other environmental impacts such as air- and water pollution (12). While healthcare providers, including physiotherapists, are often less prepared to identify or respond to sustainability issues including environmental threats (13–15), the rising generation of health professionals is increasingly expecting their education to prepare them for building a sustainable future (16, 17). Accordingly, the undergraduate education for the next generation of physiotherapists must be significantly shaped by this concern and prepare students to work for and within a sustainable healthcare system.

International educational agreements urge universities to adopt sustainable practices across teaching and learning and have formulated policies focused on education for sustainable development, particularly the United Nations Decade of Education for Sustainable Development (18). These directives emphasize that education for sustainable development should be integrated into all university programs regardless of academic discipline rather than being limited to sustainability-focused courses. Within health care, the International Association for Health Professions Education, in 2021, provided a consensus statement (19) including a vision for educating a healthcare workforce that can deliver sustainable healthcare and promote planetary health, i.e., that our health depends on our environment. Sustainable healthcare refers to a comprehensive approach to health services that optimally balances the delivery of high-quality care, efficient resource use, and minimal environmental impact while

ensuring long-term economic and social viability (20). Three overarching learning outcomes for education for sustainable healthcare have been suggested; “describe how the environment and human health interact at different levels, demonstrate the knowledge and skills needed to improve the environmental sustainability of health systems, and discuss how the duty of a health care professional to protect and promote health is shaped by the dependence of human health on the local and global environment” (21).

Several calls to action for the physiotherapy profession and physiotherapy education to advocate for sustainable health care and planetary health have also been put forth by researchers from primarily the global north, highlighting the need for new ways to think and practice physiotherapy (22–25). Physiotherapy certainly plays a significant role in sustainable healthcare practices by using non-pharmacological and non-invasive treatments that empower patients to manage their own care in promotion, prevention, and rehabilitation (26, 27). Thus, physiotherapy can reduce the need for other more resource-intensive care solutions (24). However, physiotherapy also must reduce its carbon footprint through improvements in clinical practice by reducing waste, recycling, and promoting socially just and eco-friendly interventions for health behaviors such as zero-emission transport and a healthy diet within planetary boundaries in relevant contexts (28, 29), as well as focusing on evidence-based practice and lean service delivery. In addition, physiotherapists can also be involved in the preservation and renewal of ecosystems by engaging in the creation of public health initiatives for nature-based health (30). Physiotherapy educators therefore need to strive to integrate environmental sustainability into undergraduate physiotherapy curricula.

This study is situated within the context of Sweden, a country in the Global North where healthcare accounts for 4.5 percent of the national carbon footprint (31). The discourse on sustainable development in Sweden, much like in many other countries, has been shaped largely by Western paradigms that prioritize economic growth, environmental protection, and social equity (32). These pillars often focus on balancing the three dimensions of sustainable development rather than recognizing the interdependence and potential limits of growth. The governance of higher education in Sweden reflects an interplay between strong state regulation with a civic mission, institutional autonomy, and broader neoliberal trends (33). Academic freedom is explicitly protected by law within research while there is no equivalent explicit legal protection in teaching (34). Since 2006, the Swedish Higher Education Act has stated that higher education should promote sustainability in its activities (35). However, in 2017, the Swedish Higher Education Authority which monitors compliance

with laws and regulations found that six of eight universities providing undergraduate physiotherapy education require further development in their work on sustainable development within education (36). Since then, most universities in Sweden have become signatories to the Climate Framework (37), committing to ambitious climate action and integrating sustainability into all aspects of their operations. Thus, this legal and institutional framework reflects Sweden's broader commitment to sustainable development. Still, up to now, only 3% of all learning outcomes are sustainability-focused in Swedish undergraduate physiotherapy education, when explored through the lens of including all three dimensions of sustainable development (38).

For the successful implementation of both education for sustainable development and education for sustainable healthcare into undergraduate physiotherapy education, it is crucial for educators to comprehensively understand and embrace their role in preparing students for a sustainable future. This level of understanding necessitates that educators recognize sustainable development as a concept, as well as education for sustainable development and sustainable healthcare, but also know how to incorporate it into their teaching and learning activities. While some studies have shown that educators and healthcare professionals are not always sufficiently equipped to tackle sustainability challenges (39–42), a study on Swedish nurses and physicians has shown that they tend to endorse a rather eco-centric perspective in their ecological worldview (43). People with this perspective see humans as part of a broader ecological system, rather than as separate or dominant over nature (44), and are also more likely to engage in individual behaviors that help protect and sustain the environment (45). So far, we lack an understanding of how this translates to health profession educators, particularly educators within physiotherapy.

The aim of this study is therefore to describe Swedish physiotherapy educators' (i) consciousness of sustainable development and inclusion of sustainable development in teaching and learning activities, (ii) ecological worldviews, (iii) attitudes toward sustainability and climate change in physiotherapy, and (iv) knowledge, attitudes and self-efficacy in education for sustainable development and sustainable healthcare, as well as to (v) examine the relationship between ecological worldview and attitudes toward sustainability and climate change in physiotherapy.

Materials and methods

Research design and context

This cross-sectional, descriptive study focused on educators in undergraduate physiotherapy programs in a Swedish higher education context. As part of the adaption to the Bologna Process, the Swedish national study program in physiotherapy at first cycle level comprises 180 European Credit Transfer System credits or 3 years of full-time studies and is offered by eight different higher education institutions across Sweden. All programs adhere to the Qualification descriptor for Bachelor of Science in Physiotherapy (46). In addition to campus-based education, clinical practice is an important part of the education. Clinical practice is an educational experience under the supervision of a qualified physiotherapist in a clinical setting. For example, this could be inpatient care, primary care, or various forms of accommodation and treatment homes within municipal activities. The students in Sweden will complete approximately 1,000 clinical practice

hours of a total of 4,800 educational hours during their education. Educators within undergraduate physiotherapy education in Sweden consist mostly of physiotherapists and other professionals such as physicians, psychologists, physiologists, and behavioral scientists. Most educators have their primary employment at a university but some within healthcare. In Sweden, the proportion of women among employed physiotherapists is about 75 percent (47). Of the total number of employees at Swedish higher education institutions with research and teaching duties, irrespective of profession, 47 percent are women and 53 percent are men (48).

Participants and data collection

Five out of eight higher education institutions providing undergraduate physiotherapy education in Sweden accepted the invitation to participate in the study (Karolinska Institutet, Linköping University, Lund University, Mälardalen University, and Uppsala University). Data were collected from educators teaching or supervising, part-time or full-time, in a campus-based or clinical practice course in an undergraduate physiotherapy program in Sweden. The program directors, or equivalent persons in charge of each undergraduate physiotherapy program sent out information about the study and an invitation to participate to a total of 201 campus-based educators. Coordinators for educators in clinical practice were approached at all five programs, and three of these programs sent out the invitation to participate. Details on the exact number of educators in clinical practice who received the invitation could not be obtained due to logistic problems with duplicates of invitations from different coordinators and a lack of information on reach. Data was collected anonymously through a digital survey consisting of self-reported questions. The educators were provided with a link to the survey through the invitation letter, and it took approximately 10–15 min to complete. Three reminders were sent out to the campus-based educators, but none to the ones within clinical practice. Data was collected from March to May 2023.

Measures

Demographic characteristics included participants' sex, age, higher education institution, primary employment, profession, working title/position, participation in the program, and years of teaching/supervising. Other data was collected using other measures: the Sustainability Consciousness Questionnaire–short version (49); ecological worldviews including the New Ecological Paradigm Scale (44), attitudes toward sustainability and climate change in physiotherapy including the adapted Sustainability Attitudes in Nursing Survey 2 (50), and questions of education for sustainable development and sustainable healthcare.

Consciousness of sustainable development

Consciousness of sustainable development included knowledge of Agenda 2030, the sustainable development goals, the inclusion of sustainable development content in teaching and learning activities, attendance in courses/seminars on sustainable development in the past year and was collected through questions specifically designed for the present study as well as the Sustainability Consciousness Questionnaire

(SCQ-S). The SCQ-S is a valid and reliable measure developed to assess consciousness regarding sustainable development (49). The SCQ-S includes 27 items within three domains: economic, social, and environmental, and further assesses consciousness toward these domains in terms of three psychological factors: knowingness (recognition of the importance of sustainability), attitude (the attitudes toward sustainability), and behavior (the willingness to act toward a sustainable future). The items are rated on 5-point Likert scales, (1 = totally disagree to totally agree =5, with a neutral option in the middle), with higher scores indicating high sustainability consciousness (min 1-max 5). The total SCQ-S score for the psychological factors within each domain is divided by the number of items to give a mean total SCQ-S score for each domain (min 1-max 5). The researchers have permission to use the Swedish version of SCQ-S in this study from the rightsholders (49). The item interrelatedness (Cronbach's α) of the measure was 0.845 for the total score.

Ecological worldviews

The revised New Ecological Paradigm Scale (NEP) is a widely used, valid, and reliable measure developed to assess people's beliefs and attitudes toward ecological issues, and their views on the balance between human activities and the natural world, i.e., ecological worldview (44). The NEP is constructed of 15 items around five aspects, namely; 'human domination over nature, human exceptionalism, the balance of nature, the risk of an eco-crisis and limits to growth'. The items are rated on 5-point Likert scales. Agreement with items with odd numbers and disagreement with the even-numbered items indicate pro-environmental responses, i.e., the scale for even-numbered questions: 1 = strongly agree, 2 = mildly agree, 3 = unsure, 4 = mildly disagree, 5 = strongly disagree; and thus, with a reverted scale for odd-numbered questions. The NEP reflects either an eco-centered (nature-centered) perspective; a high NEP score identify more closely with concepts that see humans as part of natural systems and emphasize the intrinsic value of nature, or an anthropocentric (human-centered) perspective; a low NEP score identify more closely with concepts that place humans apart from, or above, natural systems and the prioritizing of human needs. The total NEP score for all items is divided by the number of items to give a mean total NEP score (min 1-max 5). The researchers have permission to use the Swedish version of NEP in this study from the rightsholders (43). The item interrelatedness (Cronbach's α) of the measure was 0.727 for the total score.

Attitudes toward sustainability and climate change in physiotherapy

The Sustainability Attitudes in Nursing Survey 2 (SANS-2) is a valid and reliable measure developed to assess nurses' attitudes toward sustainability and climate change (50). SANS-2 broadly asks respondents to indicate whether they agree/disagree with the importance of climate change and sustainability in nursing and their inclusion into nursing education, and therefore, may be applicable to various other groups. The measure has been adapted and used in a nursing faculty setting (43, 51) as well as among paramedic students (52). Further, it was adapted for use in the present study by exchanging the word nursing to physiotherapy. The item interrelatedness (Cronbach's α) of the measure was 0.776 for the total score after changing the word nursing to physiotherapy. It comprises five items assessed on a 7-point Likert scale (1 = strongly disagree to 7 = strongly agree), with higher scores indicating more positive attitudes toward

sustainability and climate change (min 1-max 7). The total SANS-2 score for all items is divided by the number of items to give a mean total SANS-2 score (min 1-max 7). The researchers have permission to use the Swedish version of SANS-2 in this study from the rightsholder (53).

Education for sustainable development and sustainable healthcare

Fourteen questions on knowledge, attitudes, and self-efficacy related to education for sustainable development and sustainable healthcare are informed by a previously published study, and the researchers have permission to use these questions from the rightsholder (54). One question related to education for sustainable development and the requirement for specific pedagogical approaches is specifically designed for the present study. The 15 questions are divided into three sections (knowledge, attitudes, and self-efficacy) and each question is rated on a Likert scale (strongly disagree to strongly agree). The item interrelatedness (Cronbach's α) of the measure was 0.897 for knowledge items, 0.748 for attitudes items, 0.884 for self-efficacy items.

Data analysis

All data were analyzed using descriptive statistics of frequencies, mean, standard deviation, and percentiles. The assumption of a normal distribution was evaluated using the Kolmogorov-Smirnov test. The item interrelatedness of the respective measures was calculated using Cronbach's α which is based on the degree of association between the item responses obtained on a single administration of the measure to a group of people. Cronbach's α is commonly interpreted using a rules-of-thumb threshold for acceptable interrelatedness of α value of at least 0.70 (55). The Pearson correlation coefficient was calculated for the correlation. The cutoff value for the strength of the correlation used was high ($r = > \pm 0.7$), moderate ($r = \pm 0.5-0.7$), low ($r = \pm 0.3-0.5$), and negligible ($r = < 0.3$), and the level of significance was set at $p = 0.05$ (56). The statistical software, SPSS version 28.0.1.1 was used in the analyses.

Results

Participants

The survey was completed by a total of 72 educators (76% females, $n = 55$) from undergraduate physiotherapy programs at five higher education institutions in Sweden. However, 50% of the educators came from one of the higher education institutions. The educators were within the age groups 20–30 years (7%, $n = 5$), 31–40 years (15%, $n = 11$), 41–50 years (32%, $n = 23$), 51–60 years (33%, $n = 24$), 61–70 years (11%, $n = 8$), and 71–80 years (1%, $n = 1$). Fifty-three percent, $n = 38$ assigned their primary employment to the university, 33%, $n = 24$ to health care, 1%, $n = 1$ to shared employment, and 13%, $n = 9$ to another employer. Eleven of the men (64%) and 27 (49%) of the women were employed at a university, and four (23%) of the men and 20 (36%) of the women within health care. The vast majority were physiotherapists by profession (86%, $n = 62$), 4%, $n = 3$ were either medical doctors, psychologists, or physiologists, and 10%, $n = 7$ had

other professions. The larger part of the educators (59%, $n = 42$) had a teaching position, while 29%, $n = 21$ were educators within clinical practice, and 12%, $n = 9$ held another position. Five (29%) of the men and 16 (29%) of the women were educators within clinical practice. The educators were active as educators in years 1, 2 and/or 3 of the education, and their years of experience as an educator varied from 1–5 years up to 31–35 years.

Consciousness of sustainable development

The educators' consciousness of sustainable development was high, with 76% reported being aware of Agenda 2030 and the sustainable development goals, and the total mean score of the Sustainability Consciousness Questionnaire for the participants was 4.49 (SD 0.34; Table 1). However, 17%, ($n = 12$) had included, content or perspectives related to sustainable development, either explicitly or implicitly, in their teaching and learning activities during 2022 or 2023, and there were various reasons for not doing so (Table 2).

Ecological worldview

The total mean score of the New Ecological Paradigm Scale for the participants was 4 (SD 0.41), indicating an eco-centered ecological worldview. The 25th, 50th, and 75th percentiles were 3.8, 4, and 4.33, respectively. Statement 10, 'The so-called "ecological crisis" facing humankind has been greatly exaggerated', showed the highest score (mean 4.61). On the contrary, the lowest score (mean 2.49) was

TABLE 1 Educators' consciousness of sustainable development ($n = 72$).

Awareness of Agenda 2030 and the global sustainable development goals, Yes/No, n (%)	55/17 (76/24)
Attendance in seminars or courses on sustainable development and/or climate change in the past 12 months, Yes/No, n (%)	23/49 (32/68)
Consciousness of sustainable development, min-max: 1–5, m (SD), $n = 67^*$	
Total score of the Sustainability Consciousness Questionnaire	4.49 (0.34)
Knowingness	4.36 (0.52)
Economic	4.35 (0.61)
Social	4.61 (0.50)
Environmental	4.11 (0.73)
Attitudes	4.74 (0.36)
Economic	4.71 (0.41)
Social	4.78 (0.38)
Environmental	4.73 (0.44)
Behaviors	4.36 (0.41)
Economic	3.76 (0.75)
Social	4.77 (0.44)
Environmental	4.55 (0.46)

*5 participants had an incorrect questionnaire completion on the Sustainability Consciousness Scale with 1–3 questions in total with missing values.

attributed to statement 14 'The earth has plenty of natural resources if we just learn how to develop them'. The items and responses in the New Ecological Paradigm Scale are summarized in [Supplementary material](#).

Attitudes toward sustainability and climate change in physiotherapy

The mean total score of the Sustainability Attitudes in Nursing Survey 2 for the participants was 5.49 (SD 0.99), with the 25th, 50th, and 75th percentiles at 4.85, 5.6, and 6.15, respectively, indicating rather positive overall attitudes toward the relevance of the topics of sustainability and climate change within physiotherapy. The larger part of the participants agreed (5–7 on a Lickert scale) that sustainability is an important issue for physiotherapy (86%) and that it should be included in the curriculum (82%). However, the attitudes toward including climate change in the physiotherapy curriculum were less positive, with one-third of the participants (28%) disagreeing (1–3 on a Lickert scale) that it should be included in the curriculum. The items and responses in the Sustainability Attitudes in Nursing Survey 2 are summarized in [Table 3](#).

Correlation between ecological worldview and attitude toward sustainability and climate change within physiotherapy

The correlation between ecological worldview (New Ecological Paradigm Scale) and attitudes toward sustainability and climate change (Sustainability Attitudes in Nursing Survey 2) was low ($r = 0.356$) and statistically significant ($p < 0.002$).

Education for sustainable development and sustainable healthcare

The larger part of the participants agreed or strongly agreed, (81%) about having content knowledge on climate and health, and half of the participants agreed or strongly agreed, (54%) about having content knowledge on sustainable health care. A smaller part of the participants agreed or strongly agreed, (17–25%) about having pedagogical content knowledge on education for sustainable development (items 3–5). A moderate to large part of the participants (56–88%) agreed or strongly agreed with the significance of health professionals and healthcare for sustainable development (items 6–10). Approximately half of the educators (51%) were unsure whether education for sustainable development requires specific teaching approaches. There was a wide variation in how participants perceived their self-efficacy in education for sustainable development and education for sustainable healthcare. The items and responses are summarized in [Table 4](#).

Discussion

To our knowledge, this is the first study to describe physiotherapy educators' overall consciousness of sustainable development,

TABLE 2 Reasons* for not including content or perspective of sustainable development in teaching and learning activities within undergraduate physiotherapy education (n = 72).

Reasons	n, (%)
Not included in the learning outcomes	34 (47%)
Not relevant to my teaching topic	21 (29%)
Do not know <i>what</i> to teach	34 (47%)
Lack of knowledge	31 (43%)
Do not know <i>how</i> to teach	22 (31%)
No space for it in the course	18 (25%)
Lack of time	18 (25%)
Lack of pedagogical support	8 (11%)
No support from the management	5 (7%)
Do not think students are interested	3 (4%)
Disagree with colleagues	1 (1%)

*Each participant could provide more than one reason.

ecological worldviews, attitudes toward sustainability and climate change in physiotherapy, as well as views on education for sustainable development and sustainable healthcare in physiotherapy undergraduate education. Our findings indicate an overall high consciousness but a rather low application of sustainable development in teaching and learning among educators in Sweden. An interesting finding was that although the educators demonstrated a rather high endorsement of eco-centric ecological worldviews and fairly positive attitudes toward sustainability in physiotherapy, attitudes toward including climate change in the physiotherapy curriculum were less positive. The findings also indicated a low correlation between educators' ecological worldviews and their overall attitudes toward sustainability and climate change in physiotherapy. Furthermore, less than 20 percent of the educators had included content or perspectives related to sustainable development in their teaching and learning activities.

The educators in the present study demonstrated somewhat stronger eco-centered ecological worldviews than the general population in Sweden and other high-income countries (57, 58). It was also slightly stronger than among nurses and physicians in Sweden (36) but somewhat weaker than among environmentalists in the United Kingdom and Norway (58, 59). The findings of less positive attitudes toward including climate change in physiotherapy education give rise to a question of whether or not educators endorse an eco-centric perspective privately but adopt a more anthropocentric perspective in their professional roles. While there is limited research on this phenomenon within the framework of the New Ecological Paradigm Scale, previous research indicates that healthcare professionals take more action in their personal than professional lives to protect the environment, particularly those with strong professional identities (60). This aligns with findings that pro-environmental behavior does not easily transfer between personal and professional contexts (61, 62). However, difficulties implementing issues related to sustainable development and climate change at work within healthcare or higher education might also be due to work culture, established policies, or attitudes of the staff or leadership (63). There is also growing recognition that the traditional model of sustainable development may be insufficient to address the scale and complexity of the ecological crises (64–66). The eco-centric worldview that most of the educators in this study hold, challenges the anthropocentric

assumptions often embedded within the discourse on sustainable development, where environmental actions are sometimes justified solely as means to ensure human survival rather than as ethical imperatives to protect the inherent worth of the natural world.

In healthcare, the focus is often on immediate patient needs, with professional identity often tied to an anthropocentric perspective, where human individual health is the primary concern. Consistent with previous research (13, 41, 67), educators within physiotherapy in Sweden understood the effects of climate change on human health and that healthcare is part of the sustainability problem. However, increasing emphasis is also being placed on the critical role of health professionals as leaders, educators, and advocates in addressing environmental deterioration such as climate change (39, 68–71). To address this, frameworks like sustainable healthcare practices (20) and learning outcomes for sustainable healthcare (21) need to be integrated into physiotherapy education, practice, and research in Sweden (26, 72). Making sustainable healthcare “business as usual” in healthcare, with organizational support for climate-resilient services (73), might be crucial for fostering future physiotherapists equipped to navigate this transition. As noted by the Swedish National Council on Medical Ethics (74), healthcare professionals must contribute to climate action due to its profound public health impact. Educators must, therefore, embrace moral courage, speak up when ethical values are compromised (75) by reinterpreting the principles of *primum non nocere* (first, do no harm) and recognizing the vitality of the planet as the fundamental foundation for human health (76). World Physiotherapy's Position Statement for Climate and Health provides a pathway to promote and incorporate environmental sustainability into practice (77). The statement emphasizes the importance of physiotherapists acknowledging and addressing the health consequences of climate change, which highlights the growing expectation for higher education to prepare healthcare professionals for sustainability challenges.

The less positive attitude toward integrating climate change in physiotherapy education may also partly stem from political discourse, which can influence how it is approached in professional contexts. In Sweden, where climate activism is highly visible, eco-centric ecological worldviews may be privately supported, but there may also be perceptions that discussing climate change in education is risky or inappropriate, especially if seen as controversial (78). A large global survey of health professionals showed that 16% were hesitant to communicate about climate change due to concerns about controversy and 14% due to professional risk (41). How this dynamic plays out in Sweden's higher education remains unclear, but by framing education for sustainable development and sustainable healthcare through the lens of health consequences (79, 80), educators can create space for these discussions without falling into political traps. Leadership from national organizations like the Swedish Association of Physiotherapists (81) might play a pivotal role in reshaping professional norms within physiotherapy. By integrating sustainable development within planetary boundaries into the profession's core identity, physiotherapists can be positioned as key actors in addressing both human and planetary health. The Swedish Society of Medicine and the Swedish Society of Nursing have already set guidelines for their respective professions to adopt sustainable and climate-conscious healthcare practices (82, 83). This momentum should inspire the physiotherapy profession in Sweden to similarly advance and keep pace with this transition.

Nearly half of the educators who did not teach for sustainable development referred to the absence of relevant learning outcomes or uncertainty about what to teach. While they rated their content

TABLE 3 Sustainability and climate change attitudes among physiotherapy educators ($n = 72$).

SANS* items	Strongly agree 7	6	5	4	3	2	Strongly disagree 1	Mean (SD)
	N (%)	n (%)	n (%)	n (%)	N (%)	n (%)	n (%)	
1. Climate change is an important issue for physiotherapy.	20 (27.8)	10 (13.9)	20 (27.8)	12 (16.7)	7 (9.7)	2 (2.8)	1 (1.4)	5.19 (1.51)
2. Issues about climate change should be included in the physiotherapy curriculum.	12 (16.7)	9 (12.5)	18 (25)	13 (18.1)	13 (18.1)	5 (6.9)	2 (2.8)	4.60 (1.62)
3. Sustainability is an important issue for physiotherapy.	31 (43.1)	17 (23.6)	14 (19.4)	7 (9.7)	3 (4.2)	0	0	5.92 (1.18)
4. Sustainability should be included in the physiotherapy curriculum.	27 (37.5)	15 (20.8)	17 (23.6)	7 (9.7)	3 (4.2)	1 (1.4)	2 (2.8)	5.63 (1.48)
5. I apply sustainability principles at home.	30 (41.7)	23 (31.9)	15 (20.8)	4 (5.6)	0	0	0	6.10 (0.92)

*The Sustainability Attitudes in Nursing Survey 2.

knowledge of sustainable development as relatively high, they were unsure about how to teach or inspire students on this topic. When educators are tasked with a teaching and learning topic in which they might not have been formally trained or have limited practical experience, it can pose significant challenges. This can lead to ambiguity regarding the purpose of learning, resulting in a focus on learning *about* sustainability rather than a clear emphasis on learning *for* sustainability, even if its exact meaning within the field remains emergent. This situation might necessitate a transformation not only for the educator but also for the education itself (84). What is meant by development in physiotherapy? what should be learned and unlearned within physiotherapy? and how can physiotherapists contribute to shaping peaceful, just, and sustainable futures? According to Sterling (85), education should not be confined to “doing things better” or simply “doing better things.” Instead, it should aim for a deeper level of change, known as transformative learning. This approach encourages a fundamental shift in perspective, enabling individuals to see and understand the world, for example, the role of physiotherapy, in entirely new ways (86). The educators’ uncertainty may also reflect the challenge of applying all dimensions of sustainable development or sustainable healthcare in educational practice. Cotton et al. found substantial variation in how sustainability was understood by lecturers from different disciplines within higher education, with a notable tendency to focus more on environmental issues than on social and economic dimensions of sustainability (87). This could also be valid for physiotherapy educators in Sweden, who might use a single dimension of sustainable development in their teaching and learning activities or unconsciously educate about or for sustainable development without explicitly using the framework. This study explored educators’ consciousness, attitudes, and knowledge of sustainable development and sustainability without providing a specific model or definition to the educators. However, a definition of sustainable healthcare was provided: “Sustainability in healthcare means designing and providing care that uses resources in a way that does not negatively affect future health and well-being.” Thus, educators could have conceptualized sustainable development without

any framework or with different sustainability lenses such as through weak sustainability approaches, i.e., the three-pillar model (88), or Venn diagram (89), or a stronger sustainability approach, i.e., the nested dependency model (4). Education for sustainable development has been criticized for its perceived vagueness and the challenge of integrating its principles across educational contexts (90–92). The broad and often abstract nature of sustainable development can lead to superficial integration within curricula, where the focus may be more on rhetoric than on substantial changes in educational practices. Thus, adopting a vision for sustainable development in physiotherapy practice in Sweden involves not only paradigmatic changes in education but also in the operational and policy frameworks guiding healthcare delivery, since part of undergraduate physiotherapy education also occurs within clinical practice. In 2018 a number of Swedish key stakeholders in local authorities and regions described major variations in how they viewed the meaning of the concept of sustainable development and its implications for the work of healthcare. Few used the term sustainable healthcare and none mentioned an environmental dimension of sustainability (93). Undergraduate physiotherapy education and educators can thus play a pivotal role by broadening curricula and the understanding of the concept by implementing sustainable development rooted in a variety of cultural traditions, including ecological Indigenous health knowledge (94). This would foster a new generation of physiotherapists who might appreciate and use alternative health knowledge systems when creating future health solutions (95).

Educators were also uncertain if specific teaching methods were needed for education for sustainable development, perhaps reflecting a tendency in academia to discuss issues based on one’s own conceptual understanding and not based on practical application. Similar gaps have been identified in nursing education, where environmental issues are treated conceptually rather than with hands-on engagement (96). Previous research on education for sustainable healthcare has also shown that it often has single-session designs and is primarily theory-based where implication for clinical practice is lacking (40). However, several pedagogical approaches can

TABLE 4 Physiotherapy educators self-reported knowledge, attitudes, and self-efficacy related to education for sustainable development and education for sustainable healthcare ($n = 72$).

	Strongly agree n (%)	Agree n (%)	Unsure n (%)	Disagree n (%)	Strongly disagree n (%)
Knowledge					
1. I can list a few examples of direct effects of climate change on human health	27 (37.5)	31 (43.1)	11 (15.3)	3 (4.2)	0
2. I know what healthcare professionals in my field can do to take action to reduce negative environmental impact	4 (5.6)	35 (48.6)	23 (31.9)	5 (6.9)	5 (6.9)
3. I know how to best explain what sustainable development means for healthcare professionals	5 (6.9)	13 (18.1)	31 (43.1)	14 (19.4)	9 (12.5)
4. I am aware of how to best teach my students about the importance of sustainable development issues for their future work	3 (4.2)	9 (12.5)	31 (43.1)	18 (25)	11 (15.3)
5. I know how best to inspire my students to be interested in sustainable development issues	3 (4.2)	15 (20.8)	27 (37.5)	14 (19.4)	13 (18.1)
Attitudes					
6. The healthcare sector is part of the sustainability problem	29 (40.3)	29 (40.3)	11 (15.3)	3 (4.2)	0
7. Sustainable development should be the core business for healthcare professionals	11 (15.3)	29 (40.3)	14 (19.4)	14 (19.4)	4 (5.6)
8. Healthcare professionals have a critical role to play in achieving sustainability	9 (12.5)	32 (44.4)	24 (33.3)	5 (6.9)	2 (2.8)
9. Healthcare professionals should be equipped to advocate for change for sustainability	29 (40.3)	32 (44.4)	6 (8.3)	4 (5.6)	1 (1.4)
10. All health professions students should learn about sustainable development	34 (47.2)	29 (40.3)	4 (5.6)	4 (5.6)	1 (1.4)
11. Education for sustainable development requires specific pedagogical approaches	2 (2.8)	15 (20.8)	37 (51.4)	14 (13.9)	11 (11.1)
Self-efficacy					
12. I am confident in expanding my students' awareness of the concept of sustainable development	7 (9.7)	28 (38.9)	25 (34.7)	8 (11.1)	4 (5.6)
13. I am confident in explaining the relationship between sustainable development and my teaching content	3 (4.2)	21 (29.2)	36 (50)	9 (12.5)	3 (4.2)
14. I am confident in teaching how the healthcare sector affects the environment	6 (8.3)	24 (33.3)	28 (38.9)	3 (4.2)	11 (15.3)
15. I am confident in teaching effective ways of implementing sustainable development practices at work	5 (6.9)	18 (25)	32 (44.4)	8 (11.1)	9 (12.5)

effectively foster sustainability competencies with a focus on action competence (97, 98). There are also numerous resources and frameworks to facilitate the implementation of sustainable development and sustainable healthcare into curricula across health professions (99–101). The concept of planetary health offers a meaningful framework for operationalizing an eco-centric worldview within education (102). Such an approach extends beyond the traditional pillars of sustainable development, emphasizing the need for transformative change in societal values and behaviors to realign human activities within the Earth's ecological limits. Revising or adding learning outcomes at an overall local program level could also provide clearer direction for involved educators at the course level. This includes strategic and role-modeling leadership that engages and empowers educators to drive the development of education for sustainable development and to take responsibility for acting as stewards of the planet (103). Thus, it seems as if there is a strong need for continuous professional development among educators within physiotherapy in Sweden to prepare future physiotherapists for evolving environmental and healthcare challenges. A national discussion on how physiotherapy in Sweden should embrace sustainable development as well as education for sustainable development and sustainable healthcare is also essential. This could facilitate the transition toward a more comprehensive paradigm that also embraces the educators' eco-centered ecological worldview. Such a discussion can also draw attention to the challenges of sustainable development as a concept that can be selected, misunderstood, and misplaced in education due to ambiguity, with the consequence that the topic can be perceived as meaningless, reducing its potential to create change. Further exploration of educators' perceptions of education for sustainable development in physiotherapy would also provide valuable insights into how teaching and learning activities may be organized to support students learning for sustainable development within planetary boundaries.

Some strengths and limitations of the present study must be acknowledged. The survey was based on self-report, which may have resulted in socially desired answers. This is an inherent limitation in most surveys and while it was ensured the data collection was anonymous, self-reports are never free from bias (104). It is also possible that the study attracted those already interested in sustainable development, and that educators who responded to the survey differed from those who did not, which may have resulted in selection bias. However, the inclusion of educators from both campus and health care and other professional backgrounds than physiotherapy strengthens the findings' transferability to educators both within clinical practice and interdisciplinary educators alike. It should also be noted that the overall response rate could not be calculated, as the exact numbers of educators within the undergraduate physiotherapy education could not be retrieved. Further, the measures included in the survey did not answer the educators' positionality on sustainable development, i.e., preferred definition or if a weak or strong sustainability approach was used when answering the survey. The inclusion of different concepts in the survey, such as Agenda 2030, the sustainable development goals, sustainable development, and sustainable healthcare may also have contributed to ambiguities for the educators. The Sustainability Attitudes in Nursing Survey 2 only covers one part of the triple planetary crisis (105), namely climate change, but not pollution and loss of biodiversity. However, at the time of the development of the Sustainability Attitudes in Nursing Survey 2 (50), this concept was not

popularized and officially introduced to the healthcare community. The Swedish versions of the New Ecological Paradigm Scale and Sustainability Attitudes in Nursing Survey 2, as well as the questions on education for sustainable development and sustainable healthcare, had not been validated in physiotherapy settings prior to the use in this study, representing an additional limitation of this study. However, they have been used in several studies in other healthcare contexts with satisfying results. Further, even though the item interrelatedness for all measures was within the commonly used rule-of-thumb for acceptable value, the use of this cut-off value has been criticized for the risk of the researcher's efforts to increase alpha above a certain level by adding or deleting items (106). However, all items in the Sustainability Attitudes in Nursing Survey 2, the New Ecological Paradigm Scale, and the Sustainability Consciousness Questionnaire were used as in the original versions of the measures. One question was added to the previously published questions on education for sustainable development and sustainable healthcare, which in fact decreased the Cronbach's α value within attitudes.

Conclusion

Despite the endorsement of eco-centered ecological worldviews and a rather high consciousness of sustainable development as an overall concept, there remains a disconnect between educational attitudes and actions among Swedish physiotherapy educators. This points to the need to explore the narrative of sustainable development within physiotherapy in Sweden rooted in broader concept understanding, ethics, and reflective practice for sustainable development. A key priority should be to offer new perspectives on professional identity and continuing professional development within sustainable development. Educators might need support in translating their general consciousness into valuable applications within their professional roles.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

The requirement of ethical approval was waived by the Swedish Ethical Review Authority (Dnr 2022-07327-01). The study was conducted in accordance with the local legislation and institutional requirements. The participants provided their written informed consent to participate in this study.

Author contributions

ES: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Writing – original draft, Writing – review & editing. NB: Conceptualization,

Methodology, Writing – review & editing. APA: Conceptualization, Methodology, Writing – review & editing. APE: Conceptualization, Methodology, Writing – review & editing.

Funding

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

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.

References

- Giddings B, Hopwood B, O'Brien G. Environment, economy and society: fitting them together into sustainable development. *Sustain Dev.* (2002) 10:187–96. doi: 10.1002/sd.199
- Brundtland GH. Our common future: Report of the world commission on environment and development. UN-document a/42/427. (1987). Available at: <https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf> [Accessed October 01, 2024].
- United Nations (UN). Transforming our world: The 2030 agenda for sustainable development. (2015). Available at: <https://sdgs.un.org/2030agenda> [Accessed October 01, 2024].
- Lombardi R, Porter L, Barber A, Rogers SDF. Conceptualising sustainability in UK urban regeneration: a discursive formation. *Urban Stud.* (2011) 48:273–96. doi: 10.1177/0042098009360690
- Rockstrom J, Gupta J, Qin D, Lade SJ, Abrams JF, Andersen LS, et al. Safe and just earth system boundaries. *Nature.* (2023) 619:102–11. doi: 10.1038/s41586-023-06083-8
- Romanello M, Walawender M, Shih-Che H, Moskeland A, Palmeiro-Silva Y, Scamman D, et al. The 2024 report of the lancet countdown on health and climate change: facing record-breaking threats from delayed action. *Lancet.* (2024) 404:1847–96. doi: 10.1016/S0140-6736(24)01822-1
- Pfenning-Butterworth A, Buckley LB, Drake JM, Farner JE, Farrell MJ, Gehman ALM, et al. Interconnecting global threats: climate change, biodiversity loss, and infectious diseases. *Lancet Planet Health.* (2024) 8:e270–83. doi: 10.1016/S2542-5196(24)00021-4
- Rocque RJ, Buckley LB, Drake JM, Farner JE, Farrell MJ, Gehman ALM, et al. Health effects of climate change: an overview of systematic reviews. *BMJ Open.* (2021) 11:e046333. doi: 10.1136/bmjopen-2020-046333
- Robinson JM, Breed AC, Camargo A, Redvers N, Breed MF. Biodiversity and human health: a scoping review and examples of underrepresented linkages. *Environ Res.* (2024) 246:118115. doi: 10.1016/j.envres.2024.118115
- van Daalen K, Tonne C, Semenza JC, Rocklöv J, Markandya A, Dasandi N, et al. The 2024 Europe report of the lancet countdown on health and climate change: unprecedented warming demands unprecedented action. *Lancet Public Health.* (2024) 9:e495–522. doi: 10.1016/S2468-2667(24)00055-0
- Zurynski Y, Fischer G, Wijekulasuriya S, Leask E, Dharmayani PNA, Ellis LA, et al. Bolstering health systems to cope with the impacts of climate change events: a review of the evidence on workforce planning, upskilling, and capacity building. *Int J Health Plann Manag.* (2024) 39:781–805. doi: 10.1002/hpnm.3769
- Chen-Xu J, Corda MO, Varga O, Viegas S. Health burden and costs attributable to the carbon footprint of the health sector in the European Union. *Environ Int.* (2024) 190:108828. doi: 10.1016/j.envint.2024.108828
- Chi L, Boucaut R, Li LSK, Fryer CE, Kumar S. Australian physiotherapists' knowledge and views on the relationship between climate change, health, and physiotherapy. *Physiother Res Int.* (2024) 29:e 2085. doi: 10.1002/pri.2085

Generative AI statement

The authors declare that no Generative AI was used in the creation of this manuscript.

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.

Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpubh.2024.1509997/full#supplementary-material>

- Lister HE, Mostert K, Botha T, van der Linde S, van Wyk E, Rocher SU, et al. South African healthcare professionals' knowledge, attitudes, and practices regarding environmental sustainability in healthcare: a mixed-methods study. *Int J Environ Res Public Health.* (2022) 19:10121. doi: 10.3390/ijerph191610121
- Sánchez Ibáñez A, de Las Mercedes Hidalgo-Chacón M, Sánchez-Romero EA, Cuenca-Zaldivar JN. Situation of physiotherapy clinics in the Community of Madrid in relation to the concept of sustainability: a survey study. *Sustain For.* (2022) 14:16439. doi: 10.3390/su142416439
- Aronsson J, Nichols A, Warwick P, Elf M. Nursing students' and educators' perspectives on sustainability and climate change: an integrative review. *J Adv Nurs.* (2024) 80:3072–85. doi: 10.1111/jan.15950
- International Federation of Medical Students Associations (IFMSA). IFMSA policy document climate change. (2023). Available at: <https://ifmsa.org/policy-documents/> [Accessed October 01, 2024].
- Buckler C, Creech H. Shaping the future we want: UN decade of education for sustainable development; final report. Paris, France: UNESCO (2014).
- Shaw E, Walpole S, McLean M, Alvarez-Nieto C, Barna S, Bazin K, et al. AMEE consensus statement: planetary health and education for sustainable healthcare. *Med Teach.* (2021) 43:272–86. doi: 10.1080/0142159X.2020.1860207
- Mortimer F. The sustainable physician. *Clin Med.* (2010) 10:110–1. doi: 10.7861/clinmedicine.10-2-110
- Walpole SC, Barna S, Richardson J, Rother HA. Sustainable healthcare education: integrating planetary health into clinical education. *Lancet Planet Health.* (2019) 3:e6–7. doi: 10.1016/S2542-5196(18)30246-8
- Swärdh E, Maric F. From knowledge to action: fostering advocacy skills for planetary health in physical therapy. *Phys Ther.* (2024) 104:pzae 130. doi: 10.1093/ptj/pzae130
- Li LK, Fryer CE, Chi L, Boucaut R. Physiotherapy and planetary health: a scoping review. *Eur J Phys.* (2024):1–11. doi: 10.1080/21679169.2024.2323729
- Palstam A, Lange E. The role of physiotherapy in promoting sustainable healthcare for global health—editorial. *Eur J Phys.* (2024) 26:317–8. doi: 10.1080/21679169.2024.2409465
- Eustachio JHPP, Leal Fihlo W, Baars C, Barbosa-Silva J, Lourenção M, Barbir J, et al. Fostering the discussion of planetary health in occupational therapy and physiotherapy. *Aust Occup Ther J.* (2024) 71:423–42. doi: 10.1111/1440-1630.12959
- Palstam A, Sehdev S, Barna S, Andersson M, Liebenberg N. Sustainability in physiotherapy and rehabilitation. *Orthopaedics.* (2022) 36:279–83. doi: 10.1016/j.morth.2022.07.005
- Banerjee S, Maric F. Mitigating the environmental impact of NSAIDs-physiotherapy as a contribution to one health and the SDGs. *Eur J Phys.* (2023) 25:51–5. doi: 10.1080/21679169.2021.1976272
- Duindam D. Transitioning to sustainable healthcare: decarbonising healthcare clinics, a literature review. *Challenges.* (2022) 13:68. doi: 10.3390/challe13020068

29. Toner A, Lewis JS, Stanhope J, Maric F. Prescribing active transport as a planetary health intervention—benefits, challenges and recommendations. *Phys Ther Rev.* (2021) 26:159–67. doi: 10.1080/10833196.2021.1876598
30. Stanhope J, Maric F, Rothmore P, Weinstein P. Physiotherapy and ecosystem services: improving the health of our patients, the population, and the environment. *Physiother Theory Pract.* (2023) 39:227–40. doi: 10.1080/09593985.2021.2015814
31. Pichler PP, Jaccard IS, Weisz U, Weisz H. International comparison of health care carbon footprints. *Environ Res Lett.* (2019) 14:064004. doi: 10.1088/1748-9326/ab19e1
32. Government Offices of Sweden. The global goals and the 2030 agenda for sustainable development. (2024). Available at: <https://www.government.se/government-policy/the-global-goals-and-the-2030-Agenda-for-sustainable-development/> [Accessed November 05, 2024].
33. Holmén J. The autonomy of higher education in Finland and Sweden: global management trends meet national political culture and governance models. *Comp Educ.* (2022) 58:147–63. doi: 10.1080/03050068.2021.2018826
34. The Swedish Code of Statutes (SFS) (2010, 1408, Chapter 2, §18). Svensk författningssamling. Available at: <https://svenskforfattningssamling.se> [Accessed November 05, 2024].
35. Swedish Council for Higher Education. The Swedish higher education act (1992, 1434). (2006). Solna, Sweden. Available at: <https://www.uhr.se/en/start/laws-and-regulations/Laws-and-regulations/The-Swedish-Higher-Education-Act/> [November 05, 2024].
36. Finnveden G, Friman E, Mogren A, Palmer H, Sund P, Carstedt G, et al. Evaluation of integration of sustainable development in higher education in Sweden. *Int J Sustain High Educ.* (2020) 21:685–98. doi: 10.1108/IJSHE-09-2019-0287
37. The Association of Swedish Higher Education Institutions (SUHF). Exempelsamling till stöd för lärosätenas klimatarbete. (In Swedish). (2021). Available at: <https://suhf.se/app/uploads/2021/11/Klimatramverket-Exempelsamling-211020.pdf> [Accessed November 05, 2024].
38. Swärth E, Brodin N, Pettersson A, Palstam A. Time to rethink intended learning outcomes for sustainable development? A qualitative exploration and reflection of course syllabuses in Swedish undergraduate physiotherapy education. *J Med Educat Curri Develop.* (2024) 11:23821205241260599. doi: 10.1177/23821205241260599
39. Brennan ME, Madden DL. The evolving call to action for including climate change and environmental sustainability themes in health professional education: a scoping review. *J Clim Change Health.* (2023) 9:100200. doi: 10.1016/j.joclhm.2022.100200
40. Bray L, Meznikova K, Crampton P, Johnson T. Sustainable healthcare education: a systematic review of the evidence and barriers to inclusion. *Med Teach.* (2023) 45:157–66. doi: 10.1080/0142159X.2022.2110052
41. Kotcher J, Maibach E, Miller J, Campell E, Alqodmani L, Maiero M, et al. Views of health professionals on climate change and health: a multinational survey study. *Lancet Planet Health.* (2021) 5:e316–23. doi: 10.1016/S2542-5196(21)00053-X
42. Tun S. Fulfilling a new obligation: teaching and learning of sustainable healthcare in the medical education curriculum. *Med Teach.* (2019) 41:1168–77. doi: 10.1080/0142159X.2019.1623870
43. Wallhagen M, Magnusson P. Ecological worldview among health care professionals in Sweden. *Int J Environ Sci Nat Res.* (2022) 29:556266. doi: 10.19080/IJESNR.2022.29.55626637
44. Dunlap RE, Van Liere KD, Mertig AG, Jones RE. New trends in measuring environmental attitudes: measuring endorsement of the new ecological paradigm: a revised NEP scale. *J Soc Issues.* (2000) 56:425–42. doi: 10.1111/0022-4537.00176
45. Steg L, Vlek C. Encouraging pro-environmental behaviour: an integrative review and research agenda. *J Environ Psychol.* (1993) 29:309–17. doi: 10.1016/j.jenvp.2008.10.004
46. Swedish Council for Higher Education. Degree of bachelor of science in physiotherapy. (1993) Available at: <https://www.uhr.se/en/start/laws-and-regulations/Laws-and-regulations/The-Higher-Education-Ordinance/Annex-2/> [Accessed October 01, 2024].
47. The National Board of Health and Welfare (SoS). Statistik om legitimerad hälso- och sjukvårdspersonal 2022 samt arbetsmarknadsstatus 2021. (2023). Available at: <https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/statistik/2023-9-8743.pdf> [Accessed November 10, 2024].
48. Statistics Sweden (SCB). Higher education. Employees in higher education. (2021). https://www.scb.se/contentassets/004d567a54e942e9bcfeb1e1e2e0bba4/uf0202_2021a01_sm_uf23sm2201.pdf [Accessed November 10, 2024].
49. Gericke N, Bovee-de Pauw J, Berglund T, Olsson D. The sustainability consciousness questionnaire: the theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development. *Sustain Dev.* (2019) 27:35–49. doi: 10.1002/sd.1859
50. Richardson J, Grose J, O'Connor A, Bradbury M, Kelsey J, Doman M. Nursing students' attitudes towards sustainability and health care. *Nurs Stand.* (2015) 29:36–41. doi: 10.7748/ns.29.42.36.e9692
51. Amerson RM, Boice O, Mitchell H, Bible J. Nursing Faculty's perceptions of climate change and sustainability. *Nurs Educ Perspect.* (2022) 43:277–82. doi: 10.1097/01.NEP.0000000000000991
52. Richardson J, Allum P, Grose J. Changing undergraduate paramedic students' attitudes towards sustainability and climate change. *J Paramed Pract.* (2016) 8:130–6. doi: 10.12968/jpar.2016.8.3.130
53. Álvarez-Nieto C, Richardson J, Navarro-Perán MA, Tutticci N, Huss N, Elf M, et al. Nursing students' attitudes towards climate change and sustainability: a cross-sectional multisite study. *Nurse Educ Today.* (2022) 108:105185. doi: 10.1016/j.nedt.2021.105185
54. Brand G, Collins J, Bedi G, Bonnamy J, Barbour L, Ilangakoon C, et al. "I teach it because it is the biggest threat to health": integrating sustainable healthcare into health professions education. *Med Teach.* (2021) 43:325–33. doi: 10.1080/0142159X.2020.1844876
55. Nunnally J, Bernstein I. Psychometric theory (3rd edition). New York: McGrawHill (1994).
56. Mukaka MM. Statistics corner: a guide to appropriate use of correlation coefficient in medical research. *Malawi Med J.* (2012) 24:69–71. doi: 10.4236/jwarp.2015.77047
57. Eriksson L, Garvill J, Nordlund AM. Acceptability of travel demand management measures: the importance of problem awareness, personal norm, freedom, and fairness. *J Environ Psychol.* (2006) 26:15–26. doi: 10.1016/j.jenvp.2006.05.003
58. Olli E, Grendstad G, Wollebaek D. Correlates of environmental behaviors: bringing back social context. *Environ Behav.* (2001) 33:181–208. doi: 10.1177/0013916501332002
59. Deng J, Walker GJ, Swinnerton G. A comparison of environmental values and attitudes between Chinese in Canada and Anglo-Canadians. *Environ Behav.* (2006) 38:22–47. doi: 10.1177/0013916505278458
60. Dunphy JL. Healthcare professionals' perspectives on environmental sustainability. *Nurs Ethics.* (2014) 21:414–25. doi: 10.1177/0969733013502802
61. Littleford C, Ryley TJ, Firth SK. Context, control and the spillover of energy use behaviours between office and home settings. *J Environ Psychol.* (2014) 40:157–66. doi: 10.1016/j.jenvp.2014.06.002
62. Kollmuss A, Agyeman J. Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environ Educ Res.* (2002) 8:239–60. doi: 10.1080/13504620220145401
63. McCauley PR, Mathur K, Miab RK, Cohen N, Henriques-Thompson K, Gopinath J. Environmental sustainability, healthcare workers and healthcare students: a literature review of attitudes and learning approaches. *Health Prof Edu.* (2024) 10:12. doi: 10.55890/2452-3011.1293
64. Hariram NP, Mekha KB, Suganthan V, Sudhakar K. Sustainalism: an integrated socio-economic-environmental model to address sustainable development and sustainability. *Sustain For.* (2023) 15:10682. doi: 10.3390/su151310682
65. Sneddon C, Howarth RB, Norgaard RB. Sustainable development in a post-Brundtland world. *Ecol Econ.* (2006) 57:253–68. doi: 10.1016/j.ecolecon.2005.04.013
66. Magni G. Indigenous knowledge and implications for the sustainable development agenda. *Eur J Dent Educ.* (2017) 52:437–47. doi: 10.1111/ejed.12238
67. La Torre G, De Paula BL, Sestili C, Cocchiara RA, Barbato D, Mannocci A, et al. Knowledge and perception about climate change among healthcare professionals and students: a cross-sectional study. *SEEJPH.* (2023) 13:155. doi: 10.70135/seejph.vi.155
68. Duhaime AC, Futernick M, Alexander M, Erny BC, Etzel RA, Gordon IO, et al. Healthcare professionals need to be CCLEAR: climate collaborators, leaders, educators, advocates, and researchers. *J Clim Change Health.* (2021) 4:100078. doi: 10.1016/j.joclhm.2021.100078
69. Maibach E, Frumkin H, Ahdoot S. Health professionals and the climate crisis: trusted voices, essential roles. *World Med Health Policy.* (2021) 13:137–45. doi: 10.1002/wmh3.421
70. McKinnon S, Breakey S, Fanuele JR, Kelly DE, Eddy EZ, Tarbet A, et al. Roles of health professionals in addressing health consequences of climate change in interprofessional education: a scoping review. *J Clim Change Health.* (2022) 5:100086. doi: 10.1016/j.joclhm.2021.100086
71. Sorensen CJ, Fried LP. Defining roles and responsibilities of the health workforce to respond to the climate crisis. *JAMA Netw Open.* (2024) 7:e241435. doi: 10.1001/jamanetworkopen.2024.1435
72. Palstam A, Andersson M, Lange E, Grenholm A. A call to include a perspective of sustainable development in physical therapy research. *Phys Ther.* (2021) 101:pzaa 228. doi: 10.1093/ptj/pzaa228
73. Huang A, Cooke SM, Garsden C, Behne C, Borkoles E. Transitioning to sustainable, climate-resilient healthcare: insights from a health service staff survey in Australia. *BMC Health Serv Res.* (2024) 24:475. doi: 10.1186/s12913-024-10882-8
74. The Swedish National Council on Medical Ethics (Statens Medicinska-Etiska Råd SMER). Uttalande med anledning av klimatrisken. (2024). Available at: <https://smer.se/2024/01/05/uttalande-med-anledning-av-klimatrisken/> [Accessed October 01, 2024].
75. Murray JS. Moral courage in healthcare: acting ethically even in the presence of risk. *Online J Issues Nurs.* (2010) 15. doi: 10.3912/OJIN.Vol15No03Man02
76. Wabnitz KJ, Gabryschb S, Guinto R, Haines A, Herrmann M, Howard C, et al. A pledge for planetary health to unite health professionals in the Anthropocene. *Lancet.* (2020) 396:1471–3. doi: 10.1016/S0140-6736(20)32039-0

77. World Physiotherapy (WPT). Climate change and health. Policy statement. (2023). Available at: <https://world.physio/policy/ps-climate-change-and-health> [Accessed October 01, 2024].
78. Bengtsson S, Hansson P, Håkansson M, Östman L. Positioning controversy in environmental and sustainability education. *Environ Educ Res.* (2024) 30:1405–31. doi: 10.1080/13504622.2024.2347868
79. Rossa-Roccor V, Giang A, Kershaw P. Framing climate change as a human health issue: enough to tip the scale in climate policy? *Lancet Planet Health.* (2021) 5:e553–9. doi: 10.1016/S2542-5196(21)00113-3
80. Campbell E, Uppalapati SS, Kotcher J, Maibach E. Communication research to improve engagement with climate change and human health: a review. *Front Public Health.* (2023) 10:1086858. doi: 10.3389/fpubh.2022.1086858
81. Swedish Association of Physiotherapists (Fysioterapeuterna). Tillsammans rör vi oss framåt (In Swedish). Available at: <https://www.fysioterapeuterna.se/> [Accessed October 01, 2024].
82. Swedish Society of Nursing (Svensk Sjuksköterskeförening). Klimatsmart hälso-och sjukvård. (2024). Available at: <https://swenurse.se/publikationer/klimatsmart-halso-och-sjukvard> [Accessed October 01, 2024].
83. Swedish Society of Medicine (Svenska Läkaresällskapets arbetsgrupp för klimat, hälsa och hållbar sjukvård). SLS Hållbarhetsguide. (2022). Available at: <https://www.sls.se/om-oss/aktuellt/Nyheter/2022/sls-lanserar-hallbarhetsguide-for-lakare/> [Accessed October 01, 2024].
84. International Commission on the Futures of Education. Reimagining our futures together: A new social contract for education. Paris, France: UNESCO (2021).
85. Sterling S. Transformative learning and sustainability: sketching the conceptual ground. *Learn Teach High Educ.* (2011) 5:17–33.
86. Michel JO, Holland LM, Brunnquell C, Sterling S. The ideal outcome of education for sustainability: transformative sustainability learning. *New Dir Teach Learn.* (2020) 2020:177–88. doi: 10.1002/tl.20380
87. Cotton DR, Warren MF, Maiboroda O, Bailey I. Sustainable development, higher education and pedagogy: a study of lecturers' beliefs and attitudes. *Environ Educ Res.* (2007) 13:579–97. doi: 10.1080/13504620701659061
88. Purvis B, Mao Y, Robinson D. Three pillars of sustainability: in search of conceptual origins. *Sustain Sci.* (2019) 14:681–95. doi: 10.1007/s11625-018-0627-5
89. Connelly S. Mapping sustainable development as a contested concept. *Local Environ.* (2007) 12:259–78. doi: 10.1080/13549830601183289
90. Kopnina H. Education for the future? Critical evaluation of education for sustainable development goals. *Aust J Environ Educ.* (2020) 51:280–91. doi: 10.1080/00958964.2019.1710444
91. Selby D. The firm and shaky ground of education for sustainable development. *J Geogr Higher Edu.* (2006) 30:351–65. doi: 10.1080/03098260600717471
92. Kopnina H. Revisiting education for sustainable development (ESD): examining anthropocentric bias through the transition of environmental education to ESD. *Sustain Dev.* (2014) 22:73–83. doi: 10.1002/sd.529
93. The National Board of Health and Welfare (SoS). Bästa möjliga hälsa och en hållbar hälso-och sjukvård. (2018). Available at: <https://www.socialstyrelsen.se/globalassets/sharepoint-dokument/artikelkatalog/ovrigt/2018-2-4.pdf> [Accessed November 10, 2024].
94. Maric F, Plaisant M, Richter R. Advancing the deliberate implementation of the concept of sustainability and its alternatives in physical therapy research, practice, and education. *Physiother Theor Pract.* (2024):1–15. doi: 10.1080/09593985.2024.2395486
95. Redvers N, Schultz C, Vera Prince M, Cunningham M, Jones R, Blondin BS. Indigenous perspectives on education for sustainable healthcare. *Med Teach.* (2020) 42:1085–90. doi: 10.1080/0142159X.2020.1791320
96. Hanley F, Jakubec SL. Beyond the slogans: understanding the ecological consciousness of nurses to advance ecological knowledge and practice. *Creat Nurs.* (2019) 25:232–40. doi: 10.1891/1078-4535.25.3.232
97. Lozano R, Merrill MY, Sammalisto K, Ceulemans K, Lozano FJ. Connecting competences and pedagogical approaches for sustainable development in higher education: a literature review and framework proposal. *Sustain For.* (2017) 9:1889. doi: 10.3390/su9101889
98. Chen SY, Liu SY. Developing students' action competence for a sustainable future: a review of educational research. *Sustain For.* (2020) 12:1374. doi: 10.3390/su12041374
99. Guzmán CAF. A framework to guide planetary health education. *Lancet Planet Health.* (2021) 5:e253–5. doi: 10.1016/S2542-5196(21)00110-8
100. Environmental Physiotherapy Association (EPA). Education. Available at: <https://environmentalphysio.com/education/>. [Accessed October 01, 2024].
101. Council of Deans of Health. Education for sustainable healthcare within UK pre-registration curricula for allied health professions. (2023). Available at: <https://www.councilofdeans.org.uk/2023/12/guidance-education-for-sustainable-healthcare/> [Accessed October 01, 2024].
102. Prescott SL, Logan AC, Albrecht G, Campbell DE, Crane J, Cunsolo A, et al. The Canmore declaration: Statement of principles for planetary health. *Chall* (2018) 9:31. doi: 10.3390/challe9020031
103. McKimm J, McLean M. Rethinking health professions' education leadership: developing 'eco-ethical' leaders for a more sustainable world and future. *Med Teach.* (2020) 42:855–60. doi: 10.1080/0142159X.2020.1748877
104. Van de Mortel TF. Faking it: social desirability response bias in self-report research. *Aust J Adv Nurs.* (2008) 25:40–8.
105. United Nations Environment Programme. The triple planetary crisis: Forging a new relationship between people and the earth. (2020). Available from: https://www.unep.org/news-and-stories/speech/triple-planetary-crisis-forging-new-relationship-between-people-and-earth?gad_source=1&gclid=EAIaIqobChMlubbvz2e6GiQMvHE2RBRI1dzXHEAAAYAiAAEgLF__D_BwE [Accessed October 01, 2024].
106. Cho E, Kim S. Cronbach's coefficient alpha: well known but poorly understood. *Organ Res Methods.* (2015) 18:207–30. doi: 10.1177/1094428114555994