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Observing sustainability through the mindfulness lens: a conceptual framework based on a bibliometric review analysis

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Abstract

To shift human behaviour towards sustainability, a complete comprehension of the approaches that lead to it is required. This study aims to review potential connections between the mindfulness state and trait and changes in human behaviour toward sustainability. Using bibliometric analysis as an innovative approach in this field, combined with an expert-driven literature review, the research builds on previous works regarding sustainability and mindfulness and fosters the research field by exploring six thematic clusters, each containing a set of specific mediators that could bridge this connection. To illustrate the relationship between mindfulness and sustainable development, a framework was developed, illustrating how mindfulness-based skills could positively influence these mediators and which dimensions of sustainable development could be further impacted by it. Moreover, a mindfulness program focused on sustainability and planetary health may be an innovative way to develop competencies related to the variables identified as mediators.

Keywords Mindfulness · Sustainable development · Bibliometric analysis · Framework · Mediators

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Introduction

In recent years, the concept of mindfulness has gained significant traction not only in psychological research but also in the realm of sustainability (Saleem et al. 2021a). Initially rooted in ancient contemplative traditions, contemporary psychology has adapted mindfulness as both a state and a trait (Demarzo et al. 2014). In the evolving landscape of sustainability research, the concepts of trait/dispositional mindfulness (DM), state mindfulness, and mindfulness training have emerged as pivotal elements. Trait/dispositional mindfulness encapsulates an inherent tendency towards heightened awareness and attentiveness to the present moment. In contrast, state mindfulness denotes a temporary, situation-dependent state of mindfulness that can be cultivated and enhanced through deliberate practices. Mindfulness training, the systematic cultivation of mindfulness skills, stands at the forefront as an independent variable in our study. This triad of mindfulness dimensions is instrumental in understanding and fostering sustainable behaviour, as it influences creativity, compassion, and the decline of materialistic values (Ericson et al. 2014; Hensley 2020; Geiger et al. 2019). We aim to bridge the gap between individual mindfulness

and broader sustainability outcomes by integrating these constructs into our investigation. This sets the stage for a nuanced exploration of these interrelations throughout our research. Beyond individual well-being, mindfulness has implications for sustainable behaviour and decision-making, allowing a broader perspective on the environment and improving clarity, connection, and compassion (Panno et al. 2018). It is also important to highlight that many studies explored pro-environmental behaviour and its connection to more sustainable decisions and practices in people. Therefore, how pro-environmental behaviour is connected to mindfulness and sustainability has been addressed in this paper.

Both mindfulness state and trait can be developed by regular training that typically involves formal and informal mindfulness practices. Formal practices include techniques such as mindfulness, sitting meditation, body scan, and mindful movement exercises. Informal practices, on the other hand, involve bringing mindful awareness to daily activities such as eating, walking, and interacting with others (Demarzo et al. 2014; Thierry et al. 2022).

Interestingly, a key principle of mindfulness is non-attachment to outcomes. This means practicing mindfulness without a specific goal or desire for a particular result. The emphasis is on being fully present in the moment, observing thoughts and feelings without judgment or attachment (Kabat-Zinn 2003). Despite this principle, the application of mindfulness in various fields, including sustainability, often assigns it an instrumental value, aiming to achieve specific outcomes such as enhanced well-being, pro-environmental behaviour, and sustainable decision-making (Ericson et al. 2014; Wamsler et al. 2018). This “paradox” presents an interesting dynamic where mindfulness practices are employed to achieve certain goals while the practice itself encourages a state of being rather than doing. Our study will explore this intersection, examining how mindfulness can contribute to sustainability while maintaining its foundational principles.

Moreover, mindfulness, especially as a trait (also known as “dispositional mindfulness”), is associated with several positive psychological skills such as decentering, emotion regulation, and self-efficacy, and also with neurobiological positive changes such as increased neuron connections (Hölzel et al. 2011) in specific areas such as the insula, which is related to interoception and emotional reactivity. In the last decades, mindfulness practices are also expanding into various professional fields and disciplines (mainly health, education, sports, and business), especially secular and evidence-based mindfulness-based training programs (Wang et al. 2021). This trend has been evidenced by academia, considering the fact that 14 times more academic articles used the term “mindfulness” in 2016 than in 2006, indicating the relevance of this topic (Scopus 2022).

Among various fields researching mindfulness, sustainability is also rapidly emerging (Ericson et al. 2014; Geiger et al. 2019). Sustainability itself already has a pivotal role in the 2030 Agenda from the United Nations (UN) General Assembly. The 2030 Agenda encompasses 17 goals for sustainable development, which are to be pursued to provide all people with a decent livelihood in the future and protect the natural habitat of planet Earth (UN 2015). All the goals require sustainability-oriented solutions; hence, it is essential to identify how sustainability can be promoted more intensively. While sustainability refers to sustaining a certain status quo over time, applied in the planetary context, it can be defined as the maintenance and improvement of liveable conditions in the three pillars enclosed in the sustainability concept: economic, social, and environmental (Mensah 2019). As such, sustainability is becoming increasingly important in several aspects for all living beings on the planet to sustain liveable conditions in the future (Mensah 2019).

Achieving global sustainability is strongly linked to healthier and sustainable human behaviour, as human agency plays a decisive role in both precipitating the climate crisis through unsustainable practices and demonstrating indispensability in propelling sustainable development. Therefore, it is vital to identify which factors contribute to the shift in human behaviour towards sustainability. The potential link between sustainability and mindfulness has shown promising results, as the latest research has documented. For instance, Wamsler et al. (2018), by exploring how mindfulness can contribute to the problem of climate change, call attention to some emerging fields such as disaster management, individual well-being, organisational management, environmental behaviour, social justice, and knowledge production. Similar studies also have highlighted that mindfulness has a positive effect on subjective well-being, the activation of non-materialistic core values, consumption and sustainable behaviour, the human–nature connection, equity issues, social activism, and deliberate adaptive responses to climate change (Wamsler et al. 2018; Thiermann and Sheate 2021). Although many studies deploy literature reviews on the existing field, these mostly describe the connection between both topics, with the final aim of calling for innovative methods in further investigations (Thiermann and Sheate 2021). In addition, the creation of theoretical frameworks and knowledge maps related to sustainable development is also welcome to crystallise the knowledge developed so far, such as the mediators between several existing constructs related to mindfulness and sustainability, and highlight the next research opportunities to advance the research field.

While, as mentioned earlier, there have been efforts to synthesise knowledge at the nexus between mindfulness and sustainability, a bibliometric analysis focusing on

mindfulness and sustainability has not yet been explored in the available literature (Scopus 2022). Therefore, the advantage of bibliometric analysis in processing all current data available for identifying thematic clusters within the focused topic is highly valuable for understanding the connection between mindfulness and sustainability. In addition, the analysis assists in identifying new insights for future trends. An overview gained through the bibliometric analysis can guide further research, especially for the particularities of different thematic clusters, identifying relevant outcomes and potential mediator variables.

In this sense, while other types of reviews (e.g., systematic review) offer details on the interaction between mindfulness and sustainability, they have limited capacity to cover a large number of studies. Indeed, the recent rapid pace of publication warrants complementing systematic reviews with bibliometric reviews to gain a broader knowledge of academic fields.

Although the literature largely agrees that there is a connection between mindfulness and sustainability, the exact mechanism of the connection through mediators and how to improve them remains primarily unclear (Wamsler et al. 2018). For instance, trait or dispositional mindfulness (DM), the tendency to be more mindful in daily life, and other related skills or competencies, such as self-awareness and emotion regulation, may act as mediators in the association between mindfulness training (independent variable) and sustainability (dependent variable), functioning as potential mechanisms to explain the mindfulness training effects on sustainability (Demarzo et al. 2014).

Thus, this paper explores how mindfulness, in its multifaceted nature, intersects with and influences sustainable practices and attitudes. The urgency of addressing global sustainability challenges necessitates exploring all avenues that can foster a more sustainable mindset. Mindfulness, with its emphasis on awareness, compassion, and connectedness, appears to be a promising avenue. It encourages individuals to be more conscious of their actions, leading to more thoughtful and sustainable choices (Amel et al. 2009). Moreover, mindfulness, when understood as the state of being aware and attentive to the present moment, can foster a deeper connection with the environment, enhance empathy towards others, and reduce materialistic values, all of which are conducive to sustainable behaviour (Ericson et al. 2014).

Then, through a detailed bibliometric review analysis, this study examines the evolving discourse on mindfulness in the context of sustainability, aiming to construct a conceptual framework that bridges these two critical areas.

By delving into the existing literature, this study identifies key theoretical streams and thematic clusters that link mindfulness with various aspects of sustainability, such as environmental awareness, sustainable consumption, and ethical decision-making. It is worth noting that the cluster

of terms provided by the bibliometric analysis does not offer details on the nature of mediators. However, the networked cluster showcases how different terms are linked and what mediatory variables (terms) may exist. The hints offered by the networked clusters can help researchers interpret the interlinkages by referring to published literature.

To achieve these goals, this work was built on previous literature, and three research questions have been posed:

- (1) What is the literature landscape on the connections between mindfulness state, trait, and sustainability?
- (2) What are the mediators that are affected by mindfulness training?
- (3) How do the identified mediators affect sustainable development?

By answering the above-mentioned questions, we intend to offer a better understanding of how mindfulness practices can contribute to shaping a sustainability-oriented mindset, potentially leading to more profound and lasting changes in behaviour and policy.

Materials and methods

Type of study

In the pursuit of a comprehensive understanding of the relationship between mindfulness and sustainability, our study adopts a methodological approach that synergistically combines bibliometric analysis with an extensive literature review. This dual approach allows us to harness the strengths of both quantitative and qualitative research methods, providing a robust and nuanced exploration of the subject matter.

The bibliometric analysis offers empirical, quantitative insights into the existing body of research on mindfulness and sustainability. This analysis enables us to map the landscape of a research field, identifying key trends, pivotal studies, and central themes that have shaped the discourse over time. By quantitatively assessing publication patterns, citation networks, and thematic clusters, we gain a data-driven understanding of how mindfulness has been studied about sustainability, pinpointing gaps and opportunities for further investigation.

Complementing the bibliometric analysis, the authors conducted an expert-driven literature review that delves into a critical and contextual examination of the constructs, variables, and their interplay within the domain of mindfulness and sustainability. Through this review, it was possible to engage with the theoretical underpinnings, conceptual frameworks, and empirical findings presented in the literature. This process helped deepen the understanding of the

nuances and complexities involved and allowed the authors to draw connections between disparate studies, synthesising insights to offer a coherent narrative.

Together, the bibliometric analysis and literature review form a comprehensive methodological approach, enabling us to paint a holistic picture of the field. Specifically, this dual approach is instrumental in identifying and understanding the role of mediators in the relationship between mindfulness and sustainability, shedding light on the mechanisms through which mindfulness practices can influence sustainable behaviours and attitudes.

Finally, it is worth considering that this study considered all dimensions of sustainability (social, environmental, and economic) as equally important. This approach aligns with the principles outlined in the Agenda 2030 and the three pillars of sustainability, ensuring that no single dimension is prioritised over the others. By adopting this comprehensive perspective, the authors aimed to provide a balanced analysis that recognises the interconnectedness and equal significance of each dimension in achieving sustainable development that emerges from the research field that explores the connection between sustainability and mindfulness.

Data collection

Bibliometric analysis has been increasingly used to understand the structure of research fields and identify the extent to which different thematic areas have received attention.

Unlike systematic literature review that involves detailed content analysis of studies, bibliometric analysis relies on text mining and network analysis to understand the overall landscape of research, identify key thematic areas, and highlight major contributing elements (e.g., authors, sources, publications, etc.).

In this study, it was used to identify key thematic areas at the nexus of mindfulness and sustainability. The first step to conducting bibliometric analysis was obtaining data from academic databases. The academic database Scopus was selected for this study, given its broader coverage of scholarly fields and sources. To retrieve relevant documents, a search string considering different variants of terms related to sustainability and mindfulness was designed. Figure 1 shows the sequence of steps taken to explore the goal of this study: (1) research setting, (2) data collection, and (3) data analysis.

The first stage of the data collection strategy was based on the development of a search string to find relevant peer-reviewed documents in the literature. The search string was built and revised by the authors of this paper, and knowledge from their expertise and backgrounds in sustainability and mindfulness was bundled, bringing what would be the main terms to be considered to find relevant documents in the field. In sequence, these terms were organised in two blocks where: the first one consists of terms related to mindfulness and its alternative descriptors (self-awareness, meditation, self-compassion, zen, etc.), and the second one of terms

Research Setting	Data Collection	Data Analysis
<p><u>Sustainability through mindfulness lens</u></p> <ul style="list-style-type: none"> • Importance of mindfulness in contributing to sustainable development. • The need to address theory into practice: development of a framework capable of reflecting the theory into practice. 	<p><u>Scopus database:</u></p> <ul style="list-style-type: none"> • Definition of a search string, based on terms related to mindfulness and sustainability. <p><u>Screening process:</u></p> <ul style="list-style-type: none"> • Collection of 239 peer-reviewed documents on the Scopus database. • Abstracts were read, and 155 relevant documents were selected to proceed with the co-occurrence analysis. 	<p><u>Bibliometric analysis</u></p> <ul style="list-style-type: none"> • Co-occurrence of terms technique • Software: VOS-Viewer • Six clusters found <p><u>Expert-driven assessment and framework building</u></p> <ul style="list-style-type: none"> • Expert-driven literature review, identifying the mediators and how mindfulness is connected to sustainability. • Representative articles were selected and analysed by experts in mindfulness. • Development of a framework showing how the constructs and variables interact.

Fig. 1 Research setting, data collection, and data analysis flow (developed by the authors)

related to sustainability (sustainable development, sustainable development goals, SDGs, etc.).

Table 1 shows all adopted terms in the search string, and Fig. 2 provides more details on the process of refining the sample of papers until achieving 155, which are directly related to the discussion of this paper and were used in the data analysis stage.

In the second stage, the search string was used to find related terms in the title, abstract, and keywords of documents. Scopus database, one of the most important academic sources of peer-reviewed documents, containing more than 1.8 billion cited references and 7 thousand publishers, was adopted to perform the search (Scopus 2022). Table 1 shows all adopted terms in the search string, and Fig. 2 provides more details on the process of refining the sample of papers that are directly related to the discussion of this paper and were used in the data analysis stage (co-occurrence of terms and literature review).

The literature search was conducted on April 11, 2022, using the search strategy developed by the authors (Table 1). The final findings consisted of 332 documents, of which articles, book chapters, and review papers were considered in the analysis, while other document types have been excluded (reports, theses, letters, and undefined

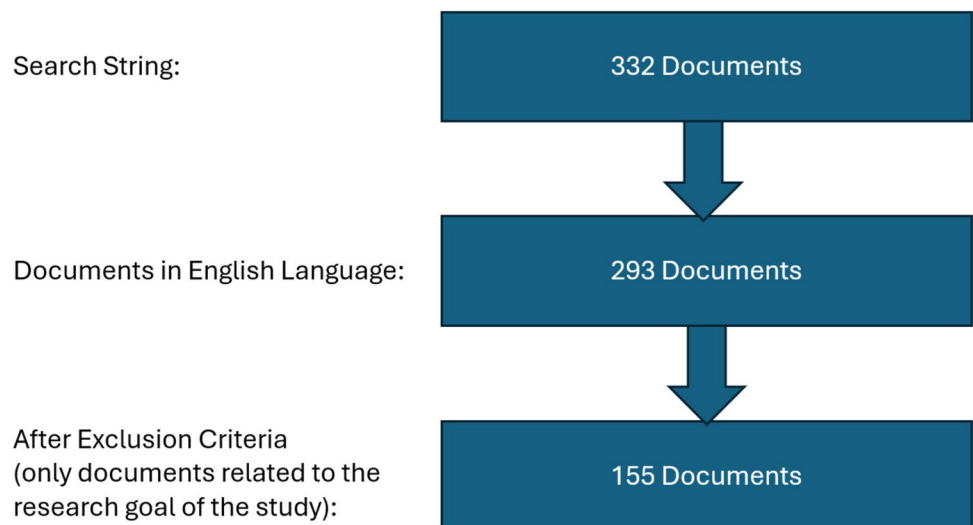
document types). After applying a language filter, the authors dropped 39 of them, remaining with 293 papers. In sequence, the authors conducted a revision and screening of all study titles and abstracts; some research documents were shown to be irrelevant and, therefore, were excluded from the final analysis, which consisted of 155 relevant documents. Only documents that are specifically focused on the linkages between mindfulness and sustainability were selected. Excluded articles contained the term ‘sustainability’ in the title, abstract, or keywords; however, it was used to refer to the sustainability of activities and programs related to mindfulness and not to the way they are linked to sustainable development.

It is worth noting that two authors were involved in the screening process. Each of these authors screened the documents separately for their relevance to the study objective. Upon completion, the authors met to reach a consensus on the final list of articles to be included in the bibliometric review. In the third stage, full bibliographic details of these documents were downloaded from Scopus to be used for bibliometric analysis using the software VOSviewer, which provides utility for highlighting thematic areas in a user-friendly and easy-to-interpret manner.

Table 1 Search strategy (developed by the authors)

Database	Search string
Scopus	(TITLE-ABS ((“mindfulness” OR “self*awareness” OR “meditation” OR “self*compassion” OR “zen” OR “Vipassana” OR “commitment therap*” OR “Dialectical Behavi*or Therapy” OR “MBSR” OR “MBCT”) AND (“SDG*” OR “sustainability” OR “2030 Agenda” OR “agenda 2030” OR “Sustainable Development”))) OR (KEY ((“mindfulness” OR “self*awareness” OR “meditation” OR “self*compassion” OR “zen” OR “Vipassana” OR “commitment therap*” OR “Dialectical Behavi*or Therapy” OR “MBSR” OR “MBCT”) AND (“SDG*” OR “sustainability” OR “2030 Agenda” OR “agenda 2030” OR “Sustainable Development”))))

Fig. 2 Selection process



Data analysis

The 155 selected documents were further used to conduct the subsequent analyses, namely, the bibliometric assessment of the literature and the literature review on sustainability.

The authors used VOSviewer software to conduct the bibliometric analysis of the literature. The software allows conducting various types of analyses, including co-citation, bibliographic coupling, and term co-occurrence (Van Eck and Waltman 2022). As the purpose of the study is to highlight key thematic areas, only term co-occurrence analysis was used. To avoid doubling keywords and further enhance the visual quality of the bibliographic figure, a thesaurus file with the keywords was created and uploaded into VOSviewer for analysis.

The co-occurrence analysis in VOSviewer shows the frequency of occurrence of each pair of terms across the corpus of scientific papers. The matrix can be constructed based on different criteria, such as author keywords, title keywords, or abstract keywords, or considering a combination of these fields. Once the co-occurrence matrix is constructed, VOSviewer applies a clustering algorithm to group terms that are highly co-occurring together into clusters and displays these clusters as a network visualisation. In the output, each node represents a key term that has frequently co-occurred with other terms in the selected literature. Larger nodes have higher values of occurrence frequency. As expected, links indicate how different terms are connected to each other. The link width is proportional to the strength of the connection. Terms that are strongly connected to each other establish clusters that indicate thematic cluster areas (Van Eck and Waltman 2022). Each one of the clusters was then discussed through a narrative approach by the authors.

To conduct the co-occurrence of terms, the chosen threshold of minimum occurrence of a term was three, meaning that the keyword appeared at least three times within the literature. It is important to notice, however, that according to the literature, there is no fixed threshold for the number of terms that is best for co-occurrence analysis. The optimal number of terms varies depending on the specific research question, the dataset's size, and the terms' characteristics (such as their specificity or variability). In this sense, after a process of moving back and forth testing several scenarios, the authors chose three as a reasonable threshold that balances comprehensiveness with the need for specificity, respecting the fact that including too few terms may lead to a limited or biased analysis, while including too many terms may lead to a cluttered or ambiguous analysis (Van Eck and Waltman 2022).

For several reasons, the co-occurrence or terms technique was chosen due to its importance in tackling this study's research goals. For example, the co-occurrence analysis can help to identify the most important themes and topics in

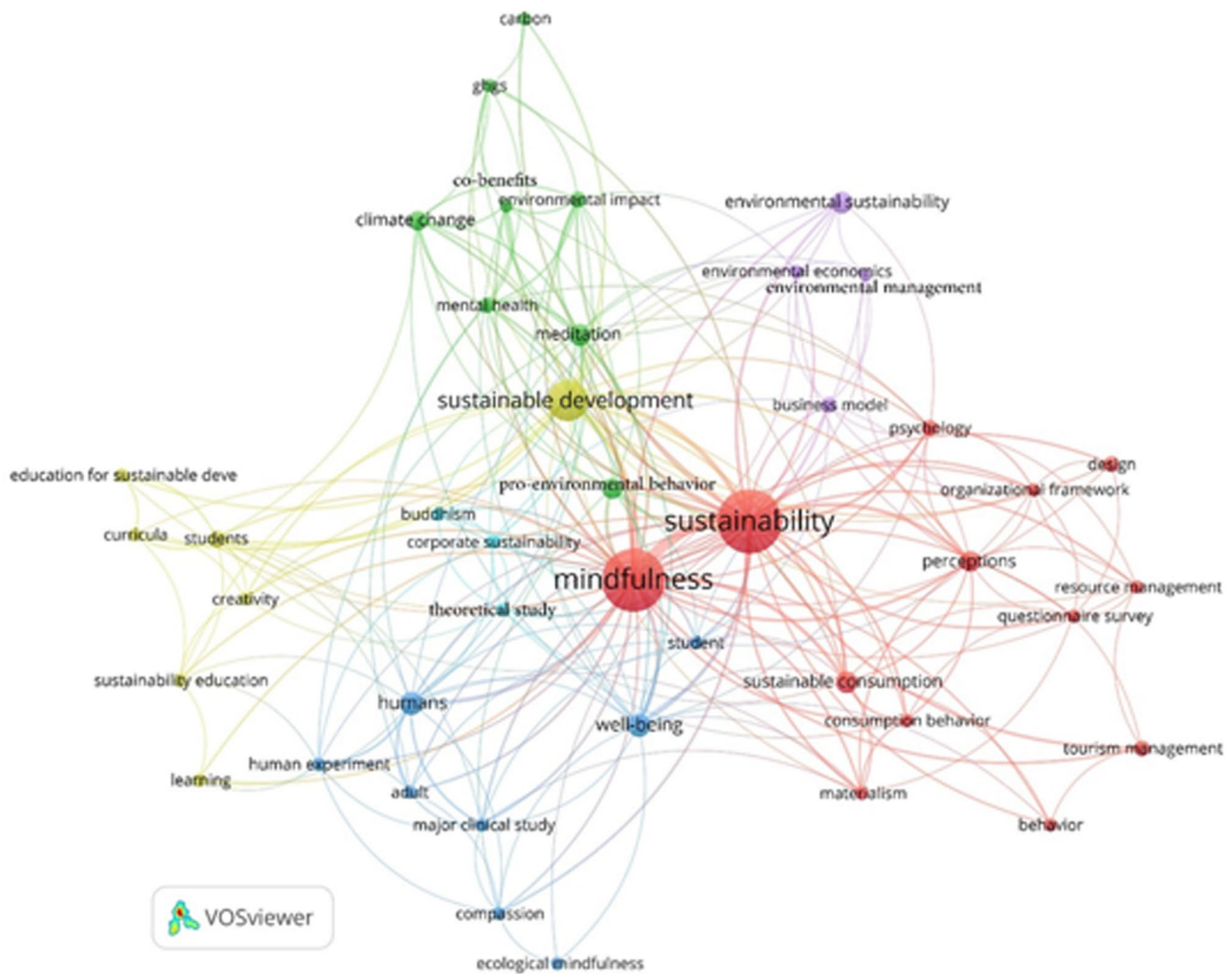
a set of scientific papers by analysing how frequently specific terms or keywords are used together, such as the six clusters found. This can be particularly useful when dealing with large and complex datasets, where it can be difficult to identify patterns or relationships through manual analysis. Second, the co-occurrence can reveal relationships between concepts, variables, constructs, or ideas, which is the case of the relationship between mindfulness and sustainable development and the mediators that are part of this relationship. Finally, the co-occurrence of terms can also unveil the main research strands and trends of a research field. In sum, the bibliometric assessment, based on the co-occurrence of terms, can be a powerful technique for scholars to understand the complexity of a research field (Van Eck and Waltman 2022).

Therefore, the bibliometric analysis conducted in this study does not aim to change the findings and the categorisations made by previous authors (Thiermann and Sheate 2021; Wamsler et al. 2018) but complements these earlier studies by unveiling what the thematic fields that emerge according to a specific technique (co-occurrence of terms) used to explore the papers are.

Finally, after the bibliometric assessment, the authors relied on further theoretical exploration using some of the papers used for the bibliometric analysis to deepen the discussion on mediators using an expert-driven literature review. In this sense, apart from the discussion of Fig. 3, two other outputs were produced to deepen the conversation: a table aiming at identifying the main approaches to mindfulness (trait, state of mind, competence, practice, etc.) that authors have been referring to and how they have been connected to sustainability (Table 2), and a theoretical framework exploring what mediators participate in the relationship between mindfulness and sustainability as well as with what sustainability dimensions each one of them are directly associated.

The bibliometric analysis combined with a literature review is not new in the literature (see Eustachio et al. 2023; Leal Filho et al. 2022). The bibliometric assessment of the literature contributed to unveiling the landscape of what researchers have been covering in a specific field and, together with a literature review, researchers could delve into particular aspects and have qualitative insights, contextual understanding, provide a critical evaluation, and contribute to the credibility and robustness of the findings. In this sense, while the bibliometric analysis offered empirical evidence, the literature review provided a critical and contextual analysis of a given research problem and brought detailed information such as constructs, variables, and the mechanisms they interplay.

Figure 2 and Table 2, supported by the bibliometric analysis, present summarised results related to examples of adopted mindfulness approaches, methods, and mediators



Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5	Cluster 6
Mindfulness and environmental sustainability	Mindfulness, sustainable resource management and consumption	Mindfulness and education for sustainability	Mindfulness and human well-being	Mindfulness and corporate sustainability	Mindfulness and economical sustainability

Fig. 3 Results of the term co-occurrence analysis showing the key thematic areas (VOSviewer output, based on the co-occurrence of terms)

that the literature considers in the possible connections between mindfulness and sustainability.

Sustainability and mindfulness framework development

As mentioned in the previous section, the advantage of the methodological approach when using a bibliometric analysis is that it offers new insights into the topic of mindfulness

and sustainability and their connections. However, while the bibliometric analysis provides insights into the relatedness of keywords frequently used in this connection, the coupled literature review, which analyses the literature encompassed into a keyword cluster, is necessary to understand the context of the relatedness. In this sense, it has been identified that specific mediator variables could be an essential part of investigating this connection further to efficiently enhance sustainability in a broad spectrum of areas.

Table 2 Mindfulness approaches and summary of connections with sustainability (Developed by the authors. Text in bold underlines the adopted mindfulness approach)

Aspects of mindfulness	Examples of adopted mindfulness approaches or methods	Summary of explored connections with sustainability
Mindfulness as a trait or competence	<p>Mindfulness as a competence: “[...] we try to empirically show the impact that mindfulness (as a competence) has on resilience and performance in higher education, thus, offering further empirical support for the need to consider mindfulness also on higher education.” (Vidal-Meliá et al. 2022, p. 2) Mindfulness as a trait: “For the current study, a short-form version of the Five Facet Mindfulness Questionnaire consisting of a 24-item scale was used, that measured an individual’s levels of the mindfulness trait, with high scores indicating high levels of mindfulness.” (Egan et al. 2022, p. 4) “Mindfulness can be trained and enhanced by practising mindfulness meditation. Basically, it involves paying attention to one’s whole experience in the moment.” (Ericson et al. 2014, p. 74) “Supporting evidence concerning direct causal effects of mindfulness, or mindfulness interventions, upon sustainable consumption behaviors is lacking” (Geiger et al. 2019, p. 8) “We designed the Mindful Climate Action (MCA) curriculum to help people improve their health while simultaneously lowering their carbon footprints” (Barrett et al. 2016) “We thought that the FFMQ facet most relevant to sustainable behavior may be that of acting with awareness; for example, by paying attention to choices during the course of one’s activities.” (Amel et al. 2009, p. 7) “We also provided preliminary evidence for a new theoretical framework suggesting that experiential strategies such as mindfulness practices could strengthen the relational pathway of pro-environmental behaviors.” (Thiermann et al. 2022, p. 1) “[...] we pilot-tested Mindful Climate Action (MCA), an eight-week adult education program that delivers energy use, climate change, and sustainability content in combination with training in mindfulness meditation [...]” (Grabow et al. 2018, p. 1) “[...] (how) does the practice of mindfulness contribute to individual behaviour change and (how) does this individual change translate into societal change? [...]” (Thiermann and Sheate 2021, p. 1). “The Contemplative Sustainable Futures Program consists of different building blocks, including teaching, networking, and research activities. These include: [...] (ii) an Experimental Learning Lab on mindfulness in sustainability science, practice, and teaching [...].” (Wamsler 2019, p. 361) “We conducted an experiment to see if mindfulness can promote sustainable behaviours in a tourism context.” (Chan 2019, p. 1) “Guidance is also offered to implement mindfulness practices to successfully enhance education for sustainable development” (Gómez-Olmedo et al. 2020, p. 1) “This paper provides a reflexive case study of the development of a mindfulness training programme specifically tailored to the context of Education for Sustainable Consumption (ESC), the so-called BiNKA-training.” (Stanszus et al. 2017, p. 6) “[...] infusing mindfulness into higher education curriculum and pedagogy can help students reconceive the role of humans on the planet and cultivate reflection, innovation, and integration to tackle the grand challenges associated with sustainability.” (Hensley 2020, p. 1)</p>	<p><i>Cluster 3: mindfulness and education for sustainability</i> - Mindfulness positively impacts academic performance, having resilience as a mediator (Vidal-Meliá et al. 2022, p. 2) <i>Cluster 4: mindfulness and human well-being</i> - There is a positive relationship between mindfulness and academic performance, which could contribute to challenges related to education. (Egan et al. 2022)</p> <p><i>Cluster 1: mindfulness and environmental sustainability</i> - Mindfulness-based practices might improve personal health and well-being (Barrett et al. 2016; Ericson et al. 2014) - Mindfulness-based practices might lower an individual’s carbon footprint (Barrett et al. 2016) - Acting with awareness is significantly and positively related to green sustainable behaviour (Amel et al. 2009, p. 7) - Individuals who meditate report having higher levels of connectedness with nature, which can lead to higher care for natural preservation (Thiermann et al. 2022) - Dispositional mindfulness is positively related to more concern for the environment (Thiermann et al. 2022) - The Mindfulness Climate Action programme impacts individual carbon footprints related to diet, transportation and household energy (Grabow et al. 2018) <i>Cluster 2: mindfulness, sustainable resource management and consumption</i> - Mindfulness Climate Action programme impacts individual carbon footprints related to diet, transportation and household energy (Grabow et al. 2018)— There is a latent need to understand the causality between mindfulness and sustainability. The literature points out that mindfulness might change Individuals’ inner dimensions, which could lead to sustainability in several aspects (Thiermann and Sheate 2021) - The literature suggests there is a positive relationship between mindfulness and subjective well-being, activation of nonmaterialistic core values, consumption and sustainable behaviour, human–nature connection and adaptive responses to climate change (Wamsler et al. 2018; Wamsler 2019) - Mindfulness practice can make individuals more aware of the sustainability aspects involved in tourism. (Chan 2019) <i>Interconnections between clusters 1 (mindfulness and environmental sustainability) and 2 (mindfulness, sustainable resource management and consumption) (mindfulness, sustainable resource management and consumption)</i> - There is a positive relationship between mindfulness with empathy, awareness of values and more sustainable behaviours (Ericson et al. 2014)</p>

Table 2 (continued)

Aspects of mindfulness	Examples of adopted mindfulness approaches or methods	Summary of explored connections with sustainability
“[...] we will discuss the implications of vital coalitions and hybrid learning for engaging people in transitions towards sustainability and ecological mindfulness and offer a prospect for educators.” (Sol and Wals 2015, p. 212)	“We explored the acceptability and effectiveness of an 8-week instructor-led mindfulness-based course “Mindfulness: Finding Peace in a Frantic World”; on [...]” (Medlicott et al. 2021, p. 1)	Cluster 3: mindfulness and education for sustainability - Mindfulness practices can promote socio-emotional competencies and enhance education for sustainable development (Gómez-Olmedo et al. 2020)
“To deeply immerse myself into the monastic life of Buddhist monks and their meditation practice, I conducted a 5-year ethnographic fieldwork in 82 Buddhist temples across Asia.” (Song 2021, p. 1)	“As an isolated training technique, mindfulness can be used as a tool to reduce the stress that is caused by efficiency-driven business models.” (Siqueria and Pitassi 2016, p. 1181)	- Mindfulness training programmes can promote education for sustainable consumption (Stanszus et al. 2017) - Implementing mindfulness in the curricula can help students tackle sustainability challenges. (Hensley 2020, p. 1)
“The purpose of this paper is to explore adaptable Buddhist teachings in economic circumstances and provide a firm theoretical foundation for a possible Buddhist management approach.” (Kovács 2014, p. 751)	“Therefore, in this research, the starting point of training participants in total attention of body and mind to present moment did not bring them to deep Presence, but it brought them to a state of calm and attention to present moment that allowed access to parts of themselves [...]” (Bernal et al. 2018, p. 650)	Cluster 4: mindfulness and human well-being - Mindfulness can mediate improvements in well-being and mental health (Sol and Wals 2015)
“Mindfulness being a universal and secular phenomenon could be enhanced through various mindfulness programmes” (Kumar et al. 2021, p. 496)	“Organizational mindfulness has been described as a relatively stable and enduring organizational attribute that results from structures and practices implemented by top management or administrators” (Ndubisi and Al-Shuridah 2019, p. 3)	Cluster 5: mindfulness and corporate sustainability - Buddhist meditative mindfulness can contribute to corporate sustainability (Song 2021) - Mindfulness can contribute to managers’ stress reduction, which could create a greater environmental concern and influence managers towards sustainability-oriented innovation (Siqueria and Pitassi 2016)
“Existing literature defines mindful organizing as vibrant practices, encompassing certain ongoing engagements, rather than a persistent characteristic of the organization” (Alwadani and Ndubisi 2019, p. 953)		- Buddhist teachings can foster managers’ ability to reflect on sustainability issues, create well-being, enhance compassion towards people, and reduce major sustainability problems. (Kovács 2014) Cluster 6: mindfulness and economic sustainability - Mindfulness can contribute to building sustainability in companies (Bernal et al. 2018) - Mindfulness-based strategies can reduce environmental vulnerability (Ndubisi and Al-Shuridah 2019) - Mindful organizing can foster environmental sustainability in the context of family business (Alwadani and Ndubisi 2019, p. 953) Employees’ mindfulness can contribute to pro-environmental behaviour in the workplace. (Kumar et al. 2021)

Our initial conceptual framework was designed to explore the relationship between mindfulness and sustainability. This framework hypothesises that mindfulness, both as a state and a trait, can influence sustainable behaviours and attitudes through several mediating variables such as emotional regulation, self-efficacy, and intrinsic values. The framework integrates insights from Geiger et al. (2019) on mindfulness and sustainable consumption and Wittmann and Sircova (2018) on time perspective and environmental behaviour, providing a comprehensive model to investigate these complex interactions.

Then, within the framework of our study, trait/dispositional mindfulness (DM) and state mindfulness are identified aspects related to mindfulness. Mindfulness training, the methodical development of mindfulness capabilities, in turn, is posited as the independent variable, driving changes in both dispositional and situational mindfulness manifestations. This approach resonates with the insights presented by Geiger and colleagues (2019), emphasising the multifaceted influence of mindfulness on sustainable consumption behaviours. Furthermore, Wittmann and Sircova's (2018) elucidation of a balanced time perspective enriches our understanding of how mindfulness can shape long-term sustainability commitments. Our conceptualisation seeks not only to align with these foundational perspectives but also to extend them by exploring how these forms of mindfulness interact with and influence pro-environmental attitudes and behaviours since they are directly affecting more sustainable decisions (Geiger et al. 2019). The hypothesised relationships and the operationalisation of these constructs form the backbone of the research design, guiding the empirical investigation and data analysis.

Scanning available literature for mediators within the six clusters identified by bibliometric analysis showed that some potential variables did not indirectly or directly influence those connections (because the variables were referring to different concepts than those mentioned of mindfulness and sustainability) and, therefore, were not considered for further analysis. The selected mediators were then allocated to the relevant clusters according to the literature from which they originated. After that, the six identified clusters were sorted into the three pillars of sustainability: economic, ecological, and social, with the final aim of finding relevant connections between clusters, sustainability aspects and mediators.

Results and discussion

The general findings of our bibliometric review analysis provide compelling evidence for the intricate relationship between mindfulness and sustainability. This relationship can be understood through the lenses of both state and trait mindfulness. State mindfulness, characterised by a

non-judgmental and present-centred awareness (Demarzo et al. 2014), may encourage individuals to recognise the immediate impact of their actions, including those related to sustainable practices. This acute awareness can lead to more conscious and deliberate choices that favour sustainable outcomes.

Trait mindfulness, conversely, reflects a more ingrained disposition towards mindful awareness in everyday life (Demarzo et al. 2014). Individuals with high levels of trait mindfulness are likely to exhibit consistent, sustainable behaviours, as they are more attuned to the long-term consequences of their actions and how they align with broader environmental and social values. Our analysis suggests that trait mindfulness could be a significant predictor of sustainable lifestyle choices and ethical decision-making.

Perspectives on connections between mindfulness and sustainability

The conceptual framework developed from our review highlights several key areas where mindfulness intersects with sustainability. For instance, in the realm of environmental awareness, mindfulness fosters a deeper connection with the natural world, enhancing empathy and concern for environmental issues. Regarding sustainable consumption, mindfulness encourages a shift away from impulsive and materialistic tendencies towards more thoughtful and intentional consumption patterns.

Furthermore, applying mindfulness in organisational contexts could lead to more ethical and sustainable business practices. Mindful leaders and employees are more likely to consider the long-term implications of business decisions, prioritise corporate social responsibility, and foster a culture of sustainability within their organisations.

Specifically, the output of the term co-occurrence analysis (Fig. 3) shows that six major thematic areas can be identified. It should, however, be mentioned that these thematic areas are not mutually exclusive, and the links show the existing interconnections and grey zones. The clusters are labelled according to their thematic areas based on the keywords and the content of the literature in each cluster: C1: Green cluster (“mindfulness and environmental sustainability”), C2: Red cluster (“mindfulness, sustainable resource management, and consumption”), C3: Yellow cluster (“mindfulness and education for sustainability”), C4: Blue cluster (“mindfulness and human well-being”), C5: Cyan cluster (“mindfulness and corporate sustainability”), C6: Purple cluster (“mindfulness and economic sustainability”). Figure 3 illustrates the clusters and the main terms belonging to each of them.

C1: The green cluster illustrates mindfulness and environmental sustainability, e.g., that climate change could be mitigated by applying mindfulness in numerous settings,

including health, education, and organisation, and how it could foster pro-environmental behaviour (Barrett et al. 2016). For instance, this could be due to the non-materialistic values, conscious behaviour, increased self-control, and awareness, which are encouraged in the practice of mindfulness (Ericson et al. 2014; Geiger et al. 2019; Amel et al. 2009; Isham et al. 2022). The findings of a study in this cluster (Thiermann et al. 2022) support this by demonstrating that mindfulness practitioners showed a lower diet-related environmental impact. Therefore, the environmental impact of human behaviour could decrease through pro-environmental behaviour fostered by mindfulness (Grabow et al. 2018), leading to possibly fewer greenhouse gasses emitted into the atmosphere. An increasing number of people engaging in pro-environmental behaviour could positively impact climate change mitigation. Also, the human health benefits of mindfulness could present a co-benefit to climate change mitigation, as well-being could be a motivation to engage in a healthier lifestyle, which may improve a more pro-environmental behaviour but also result from it (Geiger et al. 2019). The preceding co-benefits of mindfulness and pro-environmental behaviour to mitigate climate change make mindfulness a worthwhile tool for sustainable development (Thiermann et al. 2022), a term that appears close to the green cluster (Fig. 2).

C2: The red cluster connects environmental and social aspects of sustainability-focused precisely on resource management and consumption. It evidences the direct connection between mindfulness and sustainability with papers that belong to this cluster focusing on unveiling how mindfulness could contribute to the inner sphere of human beings (Wamsler 2019), such as a rise in empathy, compassion, well-being and, as a consequence, generating more interconnected and sustainable behaviour which contributes to the improved resource management (Ericson et al. 2014). For example, Wamsler et al. (2018) suggested that mindfulness could leverage issues such as well-being, adaptive responses to climate change, and sustainable consumption behaviour. Later studies found minor evidence of dispositional mindfulness explaining different consumption behaviours; however, the effects that mindfulness can have, such as the decline of material values, provide a rationale for further research (Geiger et al. 2019). Most recently, studies pointed out that mindfulness contributes indirectly to more sustainable behaviours through individual and social well-being, as suggested by Chan (2019), which also evidences that the question of causality is still in the state-of-art of the research field and the connections between mindfulness, pro-environmental behaviour and the transition toward sustainable society are expected to be further explored in the upcoming years (Thiermann and Sheate 2021).

C3: The yellow cluster discusses mindfulness in education for sustainability, evidenced by the terms related

to sustainable education, learning, creativity, curricula, students, and education for sustainable development. This cluster focuses on a deep dive into education and sustainability, and research findings within this cluster address how mindfulness training could contribute to education for sustainable development in several ways. For example, Gómez-Olmedo et al. (2020) studied how mindfulness practices could enhance education for sustainable development through emotional regulation, empathy, social connectedness, and resilience. The role of resiliency in sustainable development education has also been studied explicitly by other authors, such as Vidal-Meliá et al. (2022), who identified that mindfulness positively impacts resiliency and, indirectly, academic performance. Other studies, in turn, explore different output variables, such as how mindfulness could be an efficient pedagogical tool in education for sustainable consumption (Stanszus et al. 2017). In addition, researchers explore the pedagogical perspective by seeing mindfulness as an essential instrument that could revolutionise education for sustainable development in higher education institutions through improved learning, retention, and creativity (Hensley 2020).

C4: The blue cluster, in turn, focuses on the benefits of mindfulness to well-being and how it could potentially increase well-being and compassion among those who practice mindfulness. Therefore, research conducted within this cluster typically explores how mindfulness could increase individual awareness of environmental systems, either by sensing and presencing nature, but also how this individual empowerment can foster stronger connections within local communities, aiming at educating and developing them to become future professionals more aware of sustainability challenges (Chinn 2015; Mueller and Greenwood 2015; Sol and Wals 2015). In this context, Egan et al. (2022) assessed 206 undergraduate students and found strong evidence regarding the association of variables connected to resiliency, self-compassion, and mindfulness. This finding is also supported by Medicott et al. (2021) and colleagues, who identified a significant improvement in well-being and mental health among students who engaged in mindfulness practices.

C5: The cyan cluster has unveiled the connection between corporate sustainability and mindfulness. This connection has been studied and applied in different settings (Panditharathne and Chen 2021; Song 2021; Barakat et al. 2023), as seen in the above-mentioned thematic clusters. Therefore, it has also become of interest to organisations, which shows in the closeness of the terms “corporate sustainability” and “Buddhism”, the latter indicating where mainly mindfulness practices and concepts originated from. The author Song (2021), for instance, presented the Buddhist path as an alternative way to achieve corporate sustainability, making it a credible value of the corporation instead

of having the intention to gain more profit from it, as the usual win–win paradigm of sustainability would suggest. Therefore, the contemporary mindfulness approach and its origins, like Buddhism, have also become of interest to corporations. Since sustainability efforts have received more attention over recent years, and because of their significant environmental impact, mindfulness is considered a method to reinforce corporate sustainability (Kumar et al. 2022; Saleem et al. 2021b). Studies in the cyan cluster (“mindfulness and corporate sustainability”) show that increased mindfulness levels among employees could support corporate sustainability (Panditharathne and Chen 2021; Siqueria and Pitassi 2016; Kumar et al. 2021; Kovács 2014). The authors Panditharathne and Chen (2021) state that support from all organisational levels, including employees, is essential to implement new concepts in the organisation and that improving mindfulness levels among employees can be a supporting factor for the success of the implementation, primarily when soft skills such as open mind and acceptance may facilitate comprehending the reason behind a new, more sustainable concept.

C6: Finally, the purple cluster represents connections between mindfulness and economic sustainability, which is one of the three pillars that sustainability encloses. Economic sustainability is also highly related to corporations, as previously described within the cyan cluster (C5). According to Bernal et al. (2018), business models that incorporate mindfulness have been designed to be applied within organisations to achieve a greater extent of economic sustainability. Moreover, mindfulness influencing mediator variables, such as connectedness to nature, could promote pro-environmental behaviour and thus support corporations’ economic sustainability (Kumar et al. 2021, 2022). The effects of mindfulness on economic sustainability through the engagement in pro-environmental behaviour (identified in C1 and C3) indicates, in addition, an interlinkage between individual and organisational changes. In addition to the personal level of mindfulness in organisations, organisational mindfulness, meaning mindfulness as a trait of the organisation as a whole through collective action (Ndubisi and Al-Shuridah 2019), is examined as a way to structure environmental management within corporations. This could equally lead to increased sustainability (Ndubisi et al. 2020; Alwadani and Ndubisi 2019), for instance, through the mindfulness practice of enhanced present-moment awareness and connection to personal and company values (Ericson et al. 2014) when making decisions for the future of the corporation (Bernal et al. 2018). This assumed improvement of economic sustainability through individual or organisational mindfulness makes mindfulness a novel environmental and organisational management strategy (Ndubisi et al. 2020).

By summarising the outcomes of the bibliometric analysis and defining the clusters, it has been identified that

further understanding of connections between mindfulness aspects and sustainability is needed. For that purpose, outcomes of the bibliometric analysis have been further connected with sustainability using and summarising findings from the clusters. This has been done by exploring the most common mindfulness approaches and methods that authors are deploying in their research, as well as how mindfulness has been connected to sustainability.

Aspects of mindfulness and sustainability identified in clusters

It is worth considering that mindfulness is not treated the same by all scholars conducting research within this field, with some considering it as a fixed characteristic of an individual (trait) and others as something that could be developed over time through a mindfulness practice such as meditation or a mindfulness programme, aiming at developing individuals’ sustainability awareness either by increasing mindfulness knowledge, behaviour or by creating a state of mind.

Table 2 evidences that the term mindfulness, when it is related to sustainability, is often referred to as a state of mind or mindfulness practices that will help individuals to achieve a certain level of a desired attribute (Ericson et al. 2014; Geiger et al. 2019; Barrett et al. 2016; Thiermann et al. 2022). This suggests that the literature mostly understands mindfulness as an attribute that can change over time and be practised to create a sustainability-oriented state of mind or bring some sustainability-related knowledge or behaviour to individuals. On the other hand, it is also possible to find authors who work with the concept of mindfulness as a trait. Studies in this field usually apply scales or instruments to understand whether mindfulness can contribute to students’ academic performance (Vidal-Meliá et al. 2022; Egan et al. 2022). This important research can be used to inform the approach to developing education policies and overcoming challenges related to education.

In this sense, Table 2 summarises these findings, which were detected with the complementary literature review in the thematic clusters, by exploring what are the most common mindfulness approaches and methods that authors are deploying in their research, as well as how mindfulness has been connected to sustainability, which is further explored in Section “Aspects of mindfulness and sustainability identified in clusters”.

Mediation effect of mindfulness on sustainable development

Through an expert-driven literature review of the papers, the authors could also explore some of the mechanisms through which an independent variable influences a dependent

variable through a mediator (i.e. mediators that participate in the mindfulness-sustainability relationship).

In the studies used in the analysis, the authors mostly looked at the direct influence of mindfulness on sustainability. A lot of these studies concluded that there might be a connection between both factors (Wamsler et al. 2018). However, the exact mechanism of the connection and how to strengthen it remains mainly unclear. Reflecting on the clusters obtained from the bibliometric analysis (Fig. 3), interlinkages among different aspects of sustainability (environmental, social and economic) have been identified. Therefore, to deepen the understanding between those two terms, Fig. 4 was built to evidence the mediators related to the impact that mindfulness has on sustainable development, according to the six clusters identified by the bibliometric analysis.

In the direction of the necessity to unveil the research streams on mindfulness and sustainability, the importance of exploring whether there is a direct or indirect influence of mindfulness on sustainability has been emphasised in this study. In this sense, Fig. 4 has been divided into three parts. The left-hand part corresponds to what the literature reports on mindfulness, either if the term is considered a skill developed by regular practice or a psychological trait (dispositional mindfulness). The right-hand side of the figure depicts the six clusters found, and each one of them was organised according to the classic dimensions of sustainable development, such as economic, social, and environmental. For example, after the bibliometric analysis, it was found that the green cluster is related exclusively to the environmental dimension as it reports on the environmental aspects of sustainability; the blue and yellow clusters are connected to the social dimension, and following the same logic, the purple cluster reports on the economic aspects of sustainability.

The other two remaining clusters have a shared relation with two sustainability dimensions, which is the case for the red cluster since responsible resource management and consumption behaviour connects to environmental and social aspects. In contrast, the cyan cluster explores the concept of corporate social responsibility, which is more connected to the economic and social factors.

In the middle, Fig. 4 shows the identified mediators, evidencing how they operate in the indirect connection between mindfulness and the several aspects connected to sustainability represented by the six clusters. The six clusters were then categorised into the sustainability dimension they majorly belong to, such that the cluster of corporate sustainability falls into the economic dimension of sustainability. This means that mediators suggested by the literature establish an effective contribution to the connection between mindfulness and all three dimensions of sustainability (social, economic, and environmental). Moreover, each mediator can be categorised into one or more dimensions of sustainability

according to the corresponding cluster derived from the bibliometric analysis.

In this context, when analysing the literature review of the specific thematic clusters, it can be observed that mindfulness affects the environmental dimension of sustainability through subjective well-being, empathy, compassion, and development of healthy behaviour, which leads to the development of intrinsic values as well as sustainable values and beliefs (Ericson et al. 2014; Geiger et al. 2019; Thiermann and Sheate 2021). By practising mindfulness, it has been observed that people take more care of their well-being by being more connected to nature, and this indirectly leads to lower consumption and need for material values. Therefore, responsible resource management and consumption behaviour are suggested to be affected positively by healthy behaviours and intrinsic values (feelings of happiness, appreciation of freedom, and knowledge, etc.) and negatively by others, such as extrinsic values (mainly those related to job security and income) and giving more importance on material values (Geiger et al. 2019).

The social dimension of sustainability embraces the most significant number of clusters. For the cluster related to education for sustainable development (C3), Vidal-Meliá et al. (2022) suggest that mindfulness practices could contribute to raising the level of resiliency of students and impact academic performance as a consequence. For corporate sustainability (C5), mindfulness is suggested to increase self-transcendent values, connectedness to nature, and psychological satisfaction (Kumar et al. 2021, 2022). This could lead to transformational leadership, as indicated by the literature, to be one of the most effective styles of leadership that could help drive companies towards a more sustainability-oriented state (Panditharathne and Chen 2021). The third cluster embedded in this dimension is the red one (C2), where mindfulness is expected to positively impact resource management and consumption behaviour through healthy behaviours and intrinsic values and negatively by extrinsic values and the importance of material values (Geiger et al. 2019). Finally, it was found that self-compassion and resilience could contribute positively to the blue cluster (C4) related to human well-being (Medlicott et al. 2021).

As expected, mindfulness also contributed in an indirect way to the economic dimension of sustainability, either by increasing corporate sustainability practices (C5) or by contributing to the overall financial aspects of sustainability (C6). In this sense, it was found that self-transcendent values, connectedness to nature, and psychological satisfaction could be developed through mindfulness, and those issues serve as mediators that contribute to fostering corporate sustainability (Kumar

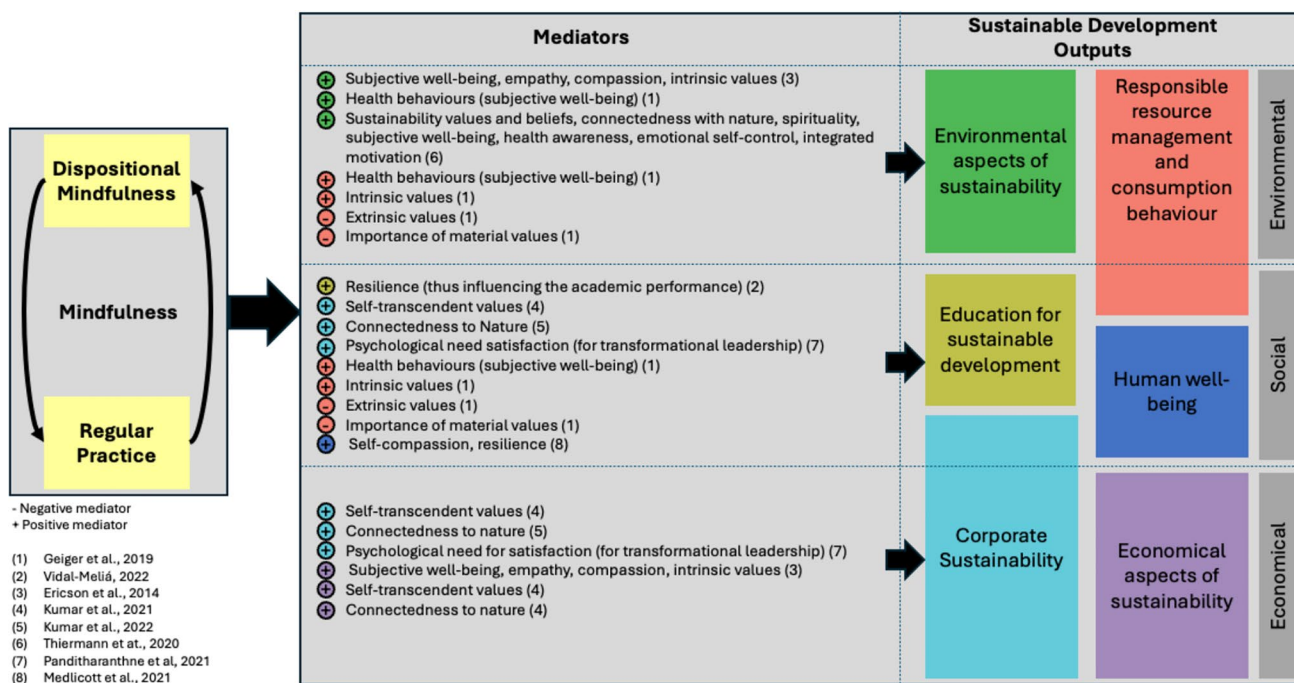


Fig. 4 Mindfulness mediators to sustainable development (developed by the authors)

et al. 2021; Kumar et al. 2022; Panditharathne and Chen 2021), in which some of these mediators could also contribute to issues solely related to the economic aspects of sustainability, indicated by the purple cluster (Kumar et al. 2021).

Limitations

It is important to recognize the limitations in the current body of literature, which the bibliometric analysis has brought to light. There are limitations in the bibliometric analysis itself—in some cases, it is unclear why some keywords appear in one cluster and not in another. This, of course, has to do with the process of bibliometric co-word co-occurrence analysis. Co-occurrence analysis only shows the simultaneous mention of certain words, which might be an indicator of proximity in terms of content. For example, cluster 5, named mindfulness and corporate sustainability, contains the keywords corporate sustainability, Buddhism, and theoretical study. This implies that some keywords appear in clusters that are not fully in accordance with the broad topic of the clusters, emphasising the importance of considering this in interpreting results.

Furthermore, there is a need for more empirical research to establish causal relationships between mindfulness and specific sustainable outcomes. Establishing a causality is intrinsically difficult. While studies may find correlations

between mindfulness and sustainable behaviours, proving that mindfulness directly causes these behaviours requires rigorous experimental designs, which are not always feasible. Also, mindfulness primarily focuses on individual practices and well-being, while sustainability often requires collective action and systemic changes. Understanding how individual mindfulness practices translate into broader societal impacts involves bridging this gap (Geiger et al. 2019).

The overall limitation of this study (as well as other similar studies conducted) is the difficulty in identifying the real relations between mindfulness and sustainability. This is because both mindfulness and sustainability are broad and complex concepts. Mindfulness involves a range of practices and mental states, while sustainability encompasses environmental, social, and economic dimensions. Understanding how these diverse aspects interact is inherently complex. Also, research on mindfulness and sustainability spans multiple disciplines, including psychology, environmental science, business, and sociology. This interdisciplinarity can make it difficult to integrate findings and draw clear connections.

Finally, quantifying the effects of mindfulness on sustainability practices is challenging. Mindfulness is often measured through self-reported questionnaires, which can be subjective. Sustainability outcomes can be long-term and multifactorial, making it hard to attribute changes directly to mindfulness practices.

Innovation

In this study, we explore the intricate relationship between mindfulness training, dispositional mindfulness (state and trait), and sustainability. Our innovative approach builds upon the foundational work of Geiger and colleagues (2019), who underscored the instrumental role of mindfulness in fostering sustainable consumption behaviours. Their meta-analysis provides empirical evidence of the positive association between mindfulness and sustainable behaviours, highlighting the potential of mindfulness to disrupt routine consumption patterns and promote pro-sociality, congruence of attitude and behaviour, and a deeper appreciation of values and well-being.

Furthermore, we delve into the critical role of individual time perspectives in shaping pro-environmental behaviour, drawing on the comprehensive insights provided by Wittmann and Sircova (2018). Their research emphasises the significance of a balanced time perspective, integrating a mindful, present orientation with a future-oriented perspective, as a key determinant in fostering sustainable behaviour and understanding environmental attitudes. This perspective aligns with our study's aim to explore how dispositional mindfulness, both as a state and trait, mediates the relationship between mindfulness training and sustainability outcomes.

By integrating these perspectives, our study sheds light on the nuanced mechanisms through which mindfulness training influences sustainability. We propose that mindfulness training enhances dispositional mindfulness, which, in turn, cultivates a balanced time perspective. This balanced perspective enables individuals to make more conscientious decisions, aligning immediate actions with long-term sustainability goals. Our analysis goes beyond the traditional focus on cognitive and behavioural approaches, providing a novel understanding of the underlying values and ethical principles that shape sustainable behaviours.

In doing so, our research contributes to the existing body of knowledge by documenting specific mediating factors, such as the role of time perspective and its interaction with dispositional mindfulness, that have been underexplored in previous literature. This contribution not only highlights the novelty of our approach but also underscores the significance of our findings in advancing the understanding of mindfulness and sustainability.

Conclusion

Reflecting upon our findings, the roles of trait/dispositional mindfulness, state mindfulness, and mindfulness training in fostering sustainability reveal a complex yet coherent interplay. The mediating roles of trait/dispositional and state

mindfulness underscore the profound influence of individual mindfulness on sustainability practices, resonating with the theoretical underpinnings provided by the seminal works of Geiger and colleagues (2019) and Wittmann and Sircova (2018). The study helps to foster an understanding of underlying values and ethical principles that shape sustainability behaviours. These findings not only validate the significance of mindfulness in the realm of sustainability but also open avenues for future research. Future studies might explore the longitudinal impacts of mindfulness training on sustainability, the role of mindfulness in collective environmental initiatives, or the integration of mindfulness practices into policy-making and educational programs aimed at fostering a sustainable future. Our research thus marks a step towards a more mindful and sustainable world, underscoring the potential of individual transformation as a catalyst for broader environmental stewardship.

In conclusion, the integration of mindfulness into sustainability discourse offers a promising pathway for fostering more sustainable behaviours and decision-making processes at both individual and organisational levels. This study contributes to this emerging field by providing a structured overview of the current literature and suggesting directions for future research.

Based on the findings in this review, especially from the mediators identified within each cluster, it is possible to picture that in the near future, a new mindfulness program protocol focused on sustainability and the health of the planet could be developed so that the competencies related to the variables' identified mediators are specifically developed (Crane et al. 2017).

In the future development of such a program protocol, aspects such as sustainability values and pro-environmental behaviours within cognitive and psychoeducational exercises can be reinforced in addition to enabling the regular practice of mindfulness by maintaining the classic mindfulness exercises, such as the body scan, sitting meditation and mindfulness of movements. Moreover, the new protocol could adapt some practices of mindfulness to raise awareness of a more conscious and compassionate outlook towards the environment and planetary health, in a type of "Eco Scan", resembling the "body scan" but focusing on the environment and its interdependence with life sustainability.

The study contributes greatly to the development of the new program protocol by creating the framework and identifying the clusters that provide an in-depth analysis of the available findings on this topic. In addition, it provides a valuable synthesis of existing knowledge and understanding of the topic. However, the main limitation of the study lies in the lack of accuracy in identifying the real relationship between mindfulness and sustainability.

Therefore, when designing programmes or interventions where mindfulness gets applied to enhance sustainability

aspects, the focus could be put on the mediators that lay within a cluster in the targeted sustainability aspect to enforce the connection and/or make the programme more effective.

Finally, the information gathered in this study provides a solid basis for future work on this topic. First, the results from the bibliometric assessment could be used to assist researchers in the main areas they could contribute to, as well as to discuss the connections between these clusters. The second possibility is to explore the extent to which the mediators found and discussed in the theoretical framework could be further validated, for example, by adopting a quantitative analysis such as the adoption of structural equation modelling. Third, researchers interested in this topic could also try to conduct methodological research on how to assess the different mindfulness approaches (state of mind, trait, competence, practice) and their impact on specific sustainability dimensions.

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Declarations

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.

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