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Nature connectedness and other transformative qualities associated with pro-environmental attitudes, behaviors, and engagement across scales: the direction of compassion matters

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Abstract

Non-technical summary. This study addresses the challenge of climate change by exploring how psychological qualities and meditation practices may influence pro-environmental behavior among decision-makers, by surveying 185 participants. The research found that meditation practices and compassion toward others are linked to more pro-environmental actions. Nature connectedness emerged as a key factor related to enhanced mindfulness, compassion toward others and self, and environmental efforts. Additionally, pro-environmental efforts at work were related to more engagement across the organization, including management. These findings highlight the potential of integrating personal growth practices into sustainability promoting strategies, suggesting that fostering compassion and mindfulness may support pro-environmental action.

Technical summary. Current policy approaches addressing climate change have been insufficient. Integrative approaches linking inner and outer factors of behavior change, both at the private and organizational level, have been called for. The aim of the present study was thus to conceptualize and test a model of interlinkages between trainable transformative psychological qualities, meditation practice, wellbeing, stress, and pro-environmental behaviors in the private and organizational context, among decision-makers ($N = 185$) who responded to a survey of self-completion measures covering the topics above. Results show that meditation practices and longer practice duration were associated with more pro-environmental behavior, mindfulness facets, and wellbeing. Mindfulness facets and self-compassion were associated with higher wellbeing and lower stress, but not pro-environmental behavior. Importantly, higher compassion toward others was associated with more pro-environmental behavior but was not associated with own wellbeing and stress. Greater nature connectedness was associated with more pro-environmental behavior in private- and work life, mindfulness facets, compassion toward others, self-compassion, and longer meditation duration. Furthermore, at work, personal pro-environmental efforts were associated with such efforts by others in the organization, including management, and such efforts were also associated with overall integration of sustainability work in the organization. The results can help guide future interventions.

Social media summary. Nature connectedness, compassion toward others, and meditation related to private and work life pro-environmental behaviors.

1. Introduction

Climate change, environmental degradation, and biodiversity loss are posing increasing challenges to sustainable development on a global scale (IPCC, 2022a, 2022b; Kuyper et al., 2018; O'Grady, 2021; Rockström et al., 2009). Policy approaches have not been successful in addressing the magnitude and rate of transformational change that is needed, and consequently, the sustainability goals and targets that have been established at international and national levels seem to be unattainable as currently planned (Biermann et al., 2022; Chan et al., 2020; IPCC, 2022a, 2022b).

One of the reasons of the failure of current approaches is the way in which sustainability crises, such as climate change have been framed. That is, they have been closely related to the biophysical discourse in which they have mainly been seen as an external, technical

challenge (Leichenko & O'Brien, 2019). Consequently, much focus has, so far, been placed on solutions that address external socio-economic structures, such as technological innovations and developments within infrastructure to, for example, achieve a fossil-free society (Robèrt, 2000).

However, it is becoming increasingly clear that such approaches alone will be insufficient to meet the 1.5–2 °C climate mitigation target (e.g. IPBES, 2024). The current mechanistic approach, with its emphasis on technological solutions, fails to tackle the inner root causes, including the attitudinal and behavioral components of the problem (Leichenko & O'Brien, 2019; Wamsler et al., 2021).

New approaches, which complement the current external perspective with a focus on inner factors is thus needed. In this context, psychological processes have been suggested as important targets for interventions, via, for example, mental training such as mindfulness and compassion training – where mindfulness has been described as 'to be aware of the present moment non-judgmentally' (Kabat-Zinn, 2003), and compassion has been defined as a motivation that orientates to 'a sensitivity to suffering in self and others with a commitment to try to alleviate and prevent it' (Gilbert & Choden, 2013) – as they may facilitate both wellbeing, pro-environmental attitudes, behaviors, and engagement across scales (Horlings, 2015; Ives et al., 2020; Leichenko & O'Brien, 2019; Wamsler, 2019a, 2019b). Pro-environmental attitudes and behavior has, for example, been assessed as the level of climate and environment anxiety and personal willingness to pay in the face of trade-offs (Van der Werff et al., 2013), and how often one is performing pro-environmental actions such as minimizing waste, buying, and eating organic food and using public transportation (Ivanova et al., 2020; Lynn, 2014).

The Intergovernmental Panel on Climate Change (IPCC) assessment report on impacts, adaptation, and vulnerability (IPCC, 2022a) mentions explicitly for the first time the importance of connecting inner and outer dimensions of sustainability, and addresses the importance of mindsets for supporting nature--society connectedness. The other recent IPCC assessment report (on mitigation of climate change, 2022b) as well as the recent assessment of the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES, 2024) also explicitly elaborates on the importance of inner transitions for supporting virtuous cycles of change. The report affirms that changes in values and beliefs are possible, and that mind–body practices such as meditation could enable such psychological shifts and transformations to enhance and support pro-environmental values and behaviors across scales(ibid). Such psychological processes concern people's 'inner dimensions', consisting of individual and collective values, beliefs, worldviews, motivations, and associated cognitive, emotional, and relational capacities such as mindfulness, self-awareness, compassion, empathy (Ives et al., 2023; Wamsler & Brink, 2018; Wamsler et al., 2020), and connectedness with nature – a sense of relatedness to and being a part of the natural world (e.g. Mayer et al., 2009). These capacities have recently also been identified as so-called transformative qualities, which have been clustered under the headings of awareness, connection, insight, purpose, and agency, and research indicates that interventions that comprise, for example, meditation, mindfulness, and compassion can have a positive impact on these qualities (Wamsler et al., 2020, 2021).

Contemplative mind body practices have been suggested to promote both certain psychological processes and mental health, as well as possibly pro-environmental attitudes and behavior across individual and collective/organizational levels (IPCC, 2022b). Furthermore, studies that have investigated these different factors together are yet sparse and the results are contradictory (Riordan et al., 2022; Wamsler et al., 2021). Better wellbeing and mental health have been suggested to be important for pro-environmental attitudes and behavior, as an able person is supposed to be more prone to take steps toward bridging the know-do gap (Clayton, 2020; Geiger et al., 2020; Kjell, 2011; Verplanken et al., 2020). On the other hand, climate anxiety has also been found to be related to more pro-environmental behavior (Brosch & Steg, 2021), but research on how these apparently conflicting processes are related is still lacking (Frank et al., 2021; Wamsler et al., 2021).

Furthermore, we suggest that connectedness to nature is another key transformative quality – entailing a sense of relatedness to and being part of the natural world, which has been suggested to be a basic human psychological need (Baxter & Pelletier, 2019) and has an evolutionary basis as humans have evolved in and been immediately dependent on natural environments and resources for survival therein. Therefore, it has been argued, humans tend to have an affinity for and have positive affective responses to natural environments and stimuli, especially those rich in elements signaling resources for survival – such as water, rich vegetation, and biodiversity, as well as environments with both prospect and refuge (e.g. Mayer & Frantz, 2004; Mayer et al., 2009; Ulrich, 1983). Having a higher sense of connectedness to nature has been associated with both better mental wellbeing and health, as well as more pro-environmental attitudes and behaviors, and fostering nature connectedness may thus contribute to facilitating both human and environmental sustainability (e.g. Capaldi et al., 2014; Di Fabio & Kenny, 2021; Klein et al., 2022; Mayer et al., 2009; Nisbet & Zelenski, 2011; Richardson et al., 2020; Stenfors et al., 2018, 2024).

Some prior studies have found a relation between scoring higher on trait mindfulness and having a higher sense of connectedness with nature (Schutte & Malouff, 2018), and performing a mindfulness or loving-kindness practice was found to increase nature connectedness compared to an active control (Aspy & Proeve, 2017).

Connectedness to nature may support the other transformative qualities of compassion toward others and the self, as well as mindfulness states, independently of organized meditation practices. On the other hand, connectedness to nature may also be enhanced by meditation practices.

Furthermore, the role of engagement at collective/organizational level has recently been highlighted in climate policy mainstreaming theory (Runhaar et al., 2018), such as the integration of climate change considerations into the workplace (Wamsler et al., 2021). However, the relation or 'spill-over' of pro-environmental efforts between the private *vs* the work life spheres is under studied, which is also the case regarding the relationships between nature connectedness, other transformative qualities, actual meditation practices, and pro-environmental behaviors.

Thus, the overarching aim of the present study is to test and develop a model that explores the relationships between nature connectedness, meditation, inner transformative qualities, and their relation to wellbeing, and pro-environmental attitudes and behaviors, at the private, individual, and organizational workplace levels. The hypothetical model is illustrated in Figure 1.

Specifically, the present study investigates the relations between meditation practices, psychological processes/transformative qualities – including connectedness to nature – mental

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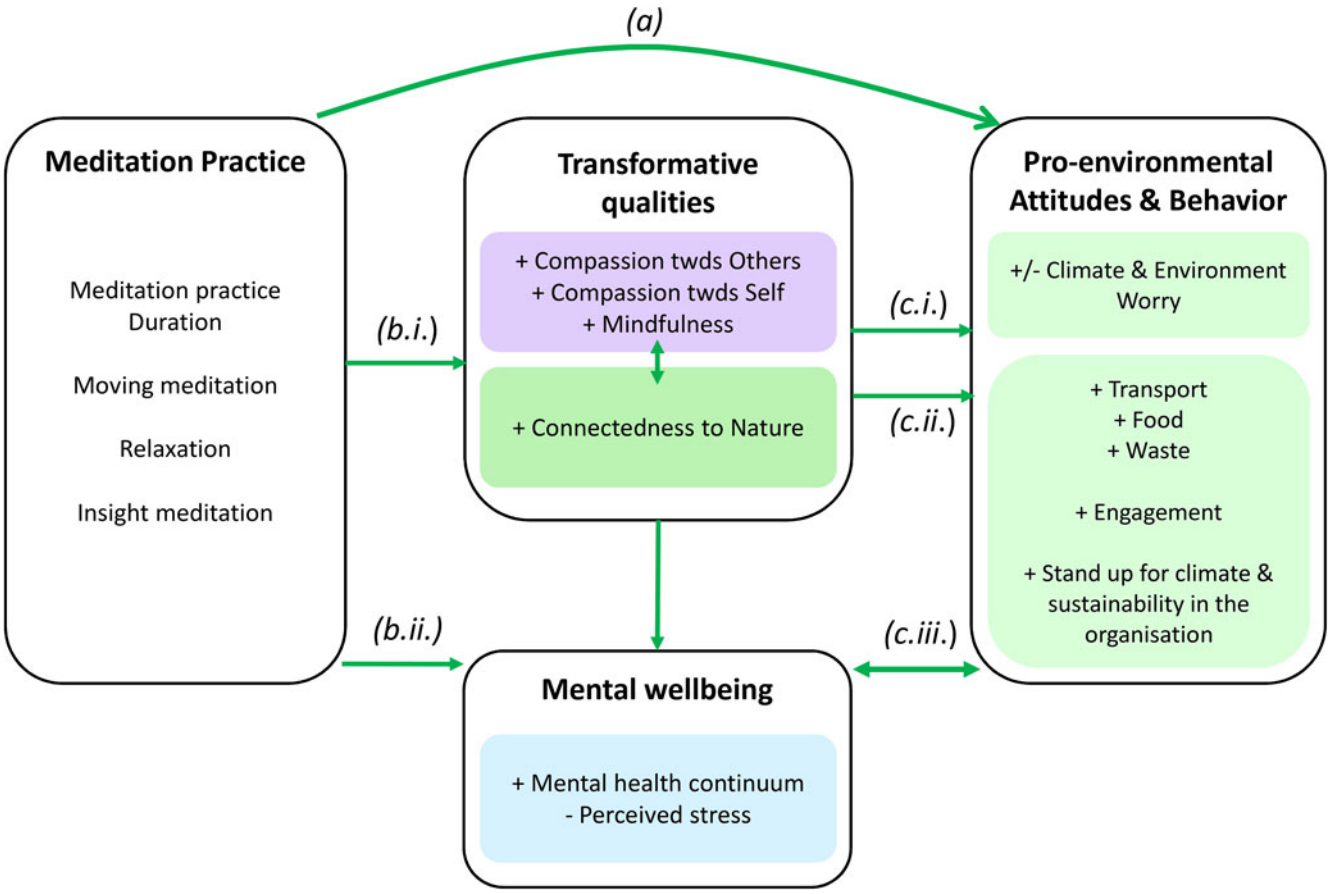

Figure 1. Conceptual model of relationships between meditation practices, transformative qualities including nature connectedness, mental wellbeing, and pro-environmental behaviors.

wellbeing, and pro-environmental attitudes, behavior and engagement in the private and work context, at individual and collective/organizational levels.

2. Methods

2.1 Sample

The participants ($N = 185$, 125 females, 80 males) consisted of mostly highly educated decision-makers in leading positions working in different sustainability-related fields from international, national, regional, or local policy institutions and multinational private companies, that were going to take part in a mindfulness and sustainability program. The study was advertised through the different organizations' communication channels (e.g. on the internal EU learning website and internal sustainability/leadership networks) and through social media platforms.

2.2 Study design and procedure

In this exploratory, cross-sectional study, participants were asked to complete an online survey regarding previous experiences of meditation practices, psychological processes, mental wellbeing, stress, as well as pro-environmental attitudes and behavior and their level of engagement to support change at organizational levels, as well as and background information (see Ramstetter et al., 2023). Some questions, such as level of mindfulness, compassion (self, others, nature) were answered by ≈ 95 participants only, due to sampling procedures.

2.3 Measures

2.3.1 Previous experience of meditation

Meditation practice was measured by asking the participants the following question, 'Are you currently practicing some of these techniques?' The question consists of three parts, one regarding moving meditation (such as Yoga, TaiChi, Qi gong, walking meditation), one regarding relaxation meditation (such as body scan, breathing, or related mindfulness exercises), and one regarding insight meditation (such as compassion, kindness, or related mindfulness exercises). The response scale was from 1 (no practice) to 5 (daily practice).

Furthermore, a question regarding duration of practice was asked: 'For how long have you been practicing the indicated techniques in the past', with the following response options ranging from 'Less than 1 year, 1–5 years, 5–10 years, More than 10 years, More than 20 years' (Rådmark et al., 2017, 2020).

2.3.2 Mindfulness

Dispositional mindfulness was measured using a selection of items of the Five Facet Mindfulness Questionnaire (FFMQ) (Baer et al., 2006, 2008; Gu et al., 2016).

Discriminating between five dimensions of mindfulness (observing, describing, acting with awareness, non-judging of

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experiences, non-reactivity to experiences), the FFMQ is particularly suited to uncover the underlying mechanisms of change in pro-environmentalism (Barbaro & Pickett, 2016). In this vein, literature suggests that the observing and non-reacting facets are the most relevant correlates of pro-environmentalism, while the effect of the describing dimension seems to be negligible (Barbaro & Pickett, 2016). To reduce the burden on respondents, items of the latter dimension were thus removed. The remaining facets were measured using two items per facet, yielding eight items that are rated on a five-point scale ranging from 1 (Never or very rarely true) to 5 (Very often or always true). Internal consistencies of the additive subscales were good (Cronbach's α 0.71).

Self-compassion was measured through six slightly rephrased items of the Self-Compassion Scale (SCS; Neff, 2003a, 2003b; Neff & McGehee, 2010), to facilitate answer behavior across scales. One example of an item was 'I'm giving myself the caring and tenderness I need'. Question items were rated on a Likert scale ranging from 1 (Never or very rarely true) to 5 (Very often or always true) (Cronbach's α 0.74). One definition of self-compassion is how you relate to yourself in a time of suffering (Neff, 2003b) and it is related to a decrease in stress and psychological ill-health, as anxiety and depression (Kirschner et al., 2019; MacBeth, & Gumley, 2012). In a prior study (Andersson et al., 2022), a self-compassion intervention was shown to have a significant impact on decreasing stress, but it is not known whether such interventions have an impact on, for example, pro-environmental attitudes and behavior.

Compassion toward others was measured through five items of the Compassionate Engagement and Action Scale (CEAS; Gilbert et al., 2017), rated on a Likert scale from 1 (Never or very rarely true) to 5 (Very often or always true) (Cronbach's α 0.70). Items ask about respondents' motivation and ability to engage in others, for example, 'I notice and am sensitive to distress in others when it arises' (engagement subscale), and respond in compassionate ways when other people are distressed, for example, 'I take the actions and do the things that will be helpful to others' (action subscale).

Connectedness with nature was measured via the visual version of the Inclusion of Nature in the Self (INS Visual) Scale (Schultz, 2002), on a scale from 1 to 7. Participants were asked to choose among seven pictures of pairs of circles (representing nature and the self) overlapping to different degrees, with seven indicating complete overlap.

2.3.3 Pro-environmental attitudes (PEA)

To assess participants' attitudes toward the environment, items were drawn from a comprehensive set of self-report scales probing different dimensions of environmental attitudes and close correlates. Items were selected to address: (a) Climate and environment anxiety ('I often feel worry when I think about climate and environmental problems'), and (b) personal willingness to pay in the face of trade-offs ('I do what is good for the climate/environment even if this costs me more money or time') (Van der Werff et al., 2013). The response scale and scoring were 1 (Disagree strongly) to 5 (Agree strongly) (Van der Werff et al, 2013).

2.3.4 Pro-environmental behavior (PEB)

To assess pro-environmental behavior, participants were asked to indicate how often they performed pro-environmental actions during the last two months with answer options ranging from 1 (Never or very rarely) to 5 (Very often or always). The items cover the three dimensions of pro-environmental behavior as proposed by Lynn (2014): behavior at home (e.g. minimizing *waste*, 2 items), purchasing behavior (e.g. buying and eating vegetarian or organic *food*, 3 items), and *transport* behavior (e.g. using public transportation, 4 items). The specific items included were selected based on their mitigation potential, including the domains of food, transport, and housing (Ivanova et al., 2020). In addition, we used items that probed participants' *engagement* or agency (7 items) for environmental causes in formal (e.g. voting for pro-environmental candidates) and informal (e.g. participation in protests) settings. A sum score was used for each domain. See items in Supplementary information.

2.3.5 Engagement at collective/organizational level

In line with climate policy mainstreaming theory (Runhaar et al., 2018), the integration of climate change considerations into the workplace were assessed with self-reports rated and coded on a 5-point scale from 1 (not at all) to 5 (fully) in three different dimensions:

(a) Sustainability at work, that is, the extent to which climate issues are considered/integrated in 10 different organizational spheres ('To what extent are climate issues considered/integrated in your current work and particularly in…'), combining the 10 items into a sum score;
(b) Personal level of influence at work in the same 10 spheres, combined into a sum score (The ten spheres included: … the type of activities/projects you are involved in; …your department/unit's field of operations (activities, projects, production processes); … the strategic priorities, aims and/or vision of your department/unit; … your department/unit's internal regulations and policies; … the planning, monitoring and evaluation tools you use; … offered training, learning & development activities; … internal working structures (e.g. groups or staff mandated to integrate the issue across sectors); … strategic cooperation with external stakeholders; … budget allocations (financial resources); … human resource allocations).
(c) Efforts to stand up for climate action and increase sustainability at work by actors at different levels in the organization, including top management, direct managers, peers, staff, and personal/your own level of engagement ('To what extent do people in your organisation stand up for climate action and/or seek to make sustainability central to your organisation?').

2.3.6 Mental health continuum (MHC)

MHC short form was used, including six items rated on a 6-point Likert scale (Keyes, 2002; Lamers et al., 2011). An index score was computed, consisting of the mean of item responses, with high scores indicating high mental wellbeing (Cronbach's α 0.86).

2.3.7 Perceived stress (PS)

PS was measured by a single item from the Perceived Stress Scale (PSS), rated on a 5-point Likert scale from 1 (low stress) to 5 (high stress): 'In the past month, I felt difficulties were piling up so high that I could not overcome them' (Cohen et al., 1983; Cohen & Williamson, 1988).

2.4 Statistical analysis

Descriptive statistics (mean and frequencies) were computed for the study variables and bivariate associations were tested using

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parametric and non-parametric correlation analyses, including partial correlations controlling for age and gender, with statistical significance evaluated according to a 95% confidence interval. Statistical analyses were conducted using SPSS 27.0. Armonk, NY: IBM Corp.

2.5 Ethical statement

All procedures performed involving human participants were in accordance with the ethical standards of the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards.

3. Results

Descriptive statistics for the study sample are shown in Table 1, and descriptive statistics for the study variables are shown in Supplementary information (Tables S1–S9).

An overview of the results is provided in Figure 2, in the framework of the hypothetical model presented in the introduction.

3.1 Main study results

3.1.1 Meditation practices and pro-environmental attitudes and behaviors

All three meditation practices (i.e. relaxation, insight, and moving mediation) as well as the duration of having practiced meditation were positively associated with pro-environmental behavior (pertaining to food and waste, but not transport), and engagement in climate and environment action (see Table 2). Longer meditation duration was associated with standing up for climate and environment issues in one's organizational work context. Moving and relaxation meditation practices, as well as longer meditation duration, were also positively associated with the pro-environmental attitude 'willingness to pay'.

3.1.2 Meditation practices: associations with transformative qualities/capacities, including connectedness to nature, and mental wellbeing

All three meditation practices (i.e. relaxation, insight, moving) as well as duration of practice were positively associated with higher levels of mindfulness and mental wellbeing (see Table 3). Yet, only moving meditation was related to self-compassion and (lower levels of) perceived stress. Neither meditation practice type nor duration was associated with compassion toward others. Furthermore, longer duration of meditation practice was associated with higher connectedness to nature. However, nature connectedness was not associated with practicing a specific meditation type.

3.1.3 Transformative qualities: associations between transformative qualities, including connectedness to nature, pro-environmental attitudes and behaviors, and mental wellbeing

In these analyses, the associations are tested between transformative qualities on the one hand (which can be affected by, and are associated with meditation practices, as observed in Table 3), and pro-environmental attitudes and behaviors, and mental health, on the other hand. This is in order to identify the transformative qualities/psychological processes which may be particularly relevant for pro-environmental attitudes and behaviors.

The results showed that mindfulness facets and self-compassion were not associated with pro-environmental behavior (see Table 4).

Compassion toward others on the contrary was associated with more pro-environmental behavior (waste, transport, and engagement domains), but not with mental wellbeing and perceived stress. In addition, mindfulness and self-compassion were associated with higher mental wellbeing and lower perceived stress.

Compassion toward others on the contrary was not associated with mental wellbeing and perceived stress. Thus, compassion toward others (which was not associated with meditation practice) was observed to be associated with more pro-environmental behavior, while self-compassion (which was also associated with meditation practices) was associated with mental wellbeing outcomes.

3.1.4 Mental wellbeing and perceived stress: associations with pro-environmental behaviors and attitudes

Higher mental wellbeing (mental health continuum) was associated with more pro-environmental behavior in the food and waste domain. Higher mental wellbeing was also associated with a work situation where sustainability issues are integrated in the organization to a higher extent, with having a higher level of personal influence at work, standing up for climate action at work, having a top management that stands up for climate action at work, and having a higher intention to integrate climate and environment issues in the work during the coming 12 months (see Table 4). Higher perceived stress, on the other hand, was associated with higher climate and environment worry but not with pro-environmental behavior. However, several trends ($0.05 > p \leqslant 0.10$) were observed which indicated that higher perceived stress was related to less pro-environmental behavior (see Table 4).

3.1.5 Nature connectedness: associations with other transformative qualities/capacities, wellbeing, and pro-environmental behavior

Higher nature connectedness stood out as clearly and consistently associated with both other transformative qualities and more pro-environmental attitudes and behaviors, including pro-environmental behaviors in the transport, food and waste domain, engagement in climate and environment action, and standing up for climate and sustainability issues in the organization at work, as well as higher climate anxiety and 'willingness to pay' (see Table 5).

3.1.6 Engagement at collective, organizational levels (i.e. at work)

As showed in the previous results sections and tables, several factors were associated with higher individual engagement with climate and sustainability issues at the organizational work level. These factors include having a higher sense of connectedness with nature and a longer duration of meditation practice.

Furthermore, all types of meditation practices, and having practiced for a longer time, as well as compassion toward others, were associated with higher general engagement in climate and environment issues.

The degree of actual integration of sustainability work in the organization and work was associated with the degree to which people at all different levels in the organization stand up for climate and sustainability issues, including from top management, to peers to the personal individual (see Table 6). Furthermore,

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Table 1. Characteristics of the study sample

Variable	Sample with partial data		Sample with all study measures	
	Frequency	%	Frequency	%
Age group				
25–34 (1)	37	20	13	13.7
35–44 (2)	49	26.5	22	23.2
45–54 (3)	74	40	42	44.2
55–64 (4)	24	13	17	17.9
Over 64 (5)	1	0.5	1	1.1
Gender				
Female (1)	125	67.6	64	67.4
Male (2)	60	32.4	31	32.6
Education				
High school	4	2.2	1	1.1
Bachelor's degree	31	16.8	11	11.6
Technical/vocational degree	4	2.2	0	0
Master's degree	97	52.4	56	58.9
Postgraduate degree	49	26.5	27	28.4
Professional role/position				
Policymaker	26	14.1	5	5.3
Leader/manager	75	40.5	53	55.8
Academic/researcher	7	3.8	3	3.2
Advocate/campaigner	6	3.2	1	1.1
Innovator/entrepreneur	7	3.8	7	7.4
Writer/thinker/communicator	22	11.9	9	9.5
Other	42	22.7	17	17.9
Area of work, organization				
Parliament or other legislature	10	5.4	2	2.1
Public sector	95	51.4	46	48.4
Private sector	65	35.1	36	37.9
Non-governmental organizations	11	5.9	7	7.4
Education/academic sector	4	2.2	4	4.2
Total	185	100	95	100

Note: A gender difference was observed regarding age. Among women, 24, 26.4, 39.2, and 10.4% were 25–34, 35–44, and 55+ years old, respectively. Among men, the corresponding percentages were 11.7, 26.7, 41.7, and 20%.

the extent to which top management and leaders in the organization, direct managers, staff, and the individual stand up for climate and sustainability issues at work, were all associated (Table 6). This highlights the role of mainstreaming sustainability work and action in organizations.

3.1.7 Gender differences

Some gender differences were observed. Women were younger and reported more frequent practice of relaxation meditation compared to men. Furthermore, women had higher levels of pro-environmental behavior in the food and waste domain, but lower influence level at work (Supplementary information).

4. Discussion and conclusions

This explorative study investigated the relations between meditation practices, wellbeing, and transformative qualities (such as mindfulness, compassion toward self and others, and connectedness with nature) and sustainable attitudes, behaviors, and engagement across different contexts and levels. It aimed to address the gap in the field where limited research has investigated these factors within the same study despite calls for such work, by, for example, the IPCC (2022b) and others (Horlings, 2015; Ives et al., 2020; Riordan et al., 2022).

The findings highlight several modifiable individual factors that are associated with pro-environmental attitudes and behaviors, which may thus potentially be addressed in future

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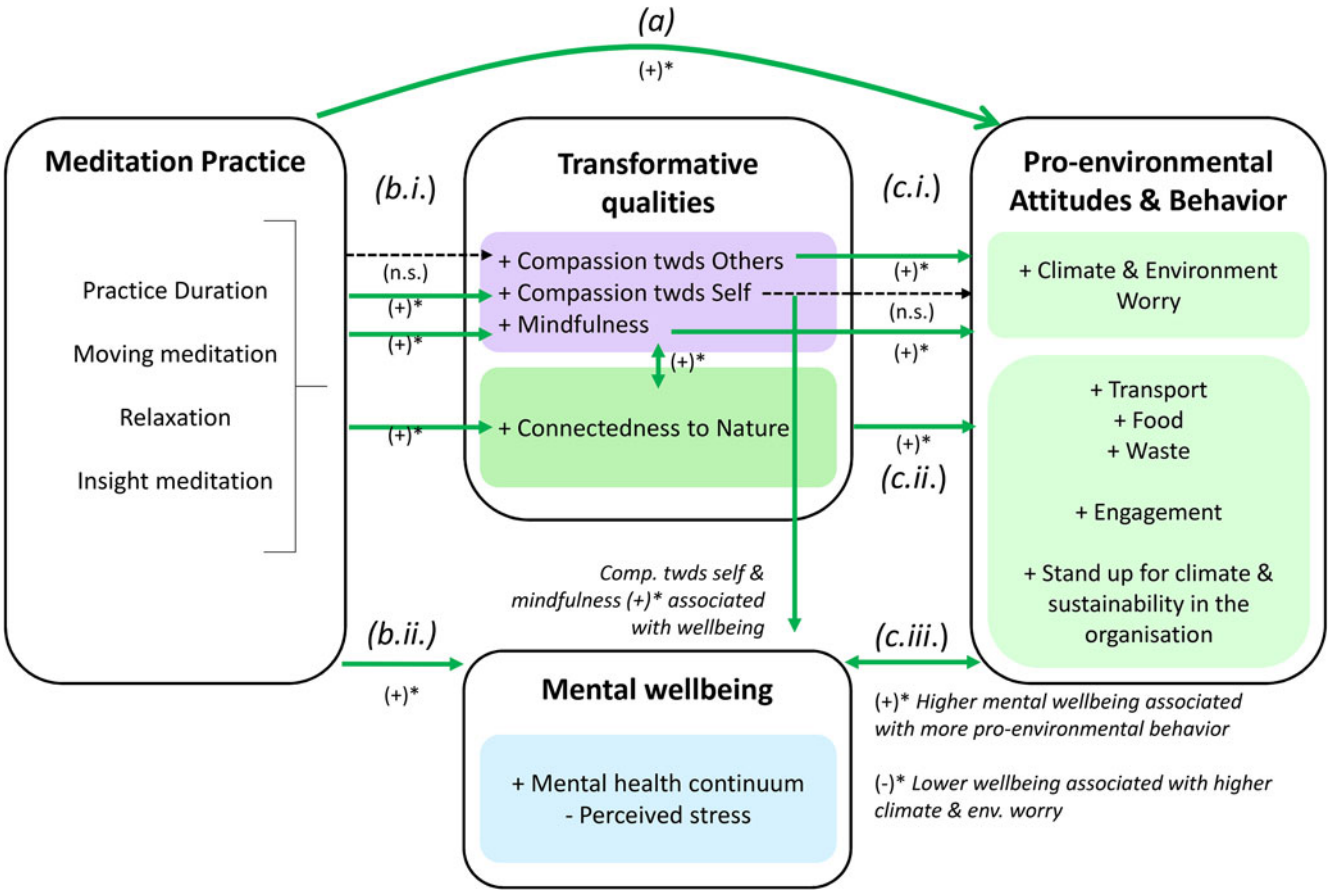

Figure 2. Overview of results in the framework of the conceptual model of relationships between meditation practices, transformative qualities including nature connectedness, mental wellbeing, and pro-environmental behaviors.

interventions to enhance pro-environmental behaviors and environmental sustainability. Notably, meditation practice duration, compassion toward others, and connectedness to nature were associated with more pro-environmental attitudes and behaviors.

In the organizational context, integration of sustainability work was associated with the degree to which people at all different levels in the organization stand up for climate and sustainability issues. Furthermore, the extent to which top management and leaders in the organization, direct managers, staff, and the individual stand up for climate and sustainability issues at work, were all associated.

Based on previous research a pre-test model was created (Figure 1), and the study results were compared with the suggested model (Figure 2) and are discussed below.

4.1 Meditation practices and pro-environmental attitudes and behaviors

Previous experience of all three meditation practices (i.e. relaxation, insight, moving) as well as duration of meditation was associated with higher levels of pro-environmental behaviors such as sustainability engagement, and more concern regarding sustainable ways of handling food and waste. Moving and relaxation meditation, and duration of meditation were in addition also associated with pro-environmental attitudes such as willingness to pay extra for more sustainable choices.

The findings of the current study are in line with a recent daily diary study that showed positive relationships between mindfulness and several pro-environmental outcomes (Richter & Hunecke, 2022). This included positive associations between mindfulness and personal ecological norm activation, connectedness to nature and wellbeing; effects of mindfulness on next-day pro-environmental behavior; and positive relationships between regular mind–body practices (such as mindfulness meditation) and daily pro-environmental behavior (Richter & Hunecke, 2022).

Especially mindfulness training has been suggested to have the potential to support sustainable attitudes and behaviors across scales (Wamsler et al., 2021). Also, earlier research has shown that all meditation practices are not the same when it comes to impact on behavior (Böckler et al., 2018; Linz et al., 2022; Roca et al., 2021). For instance, Böckler et al. (2018) showed that distinct mental trainings differentially affect altruistically motivated behavior.

They assessed established measures of pro-sociality that capture three core facets – altruistically motivated behaviors, norm motivated behaviors, and self-reported pro-sociality – and revealed differential effects of mental trainings on the subcomponents of pro-sociality. Specifically, only training of care and compassion effectively boosted altruistically motivated behavior (Böckler et al., 2018).

In addition, when comparing mindfulness practices with compassion focused practices, Hafenbrack et al. (2022) showed that loving kindness meditation in comparison with focused-breathing

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Table 2. Associations between meditation practices and pro-environmental attitudes (PEA) and behaviors (PEB), controlling for age and gender[a]

Variable		Moving meditation	Relaxation meditation	Insight meditation	Meditation duration
PEA: Climate env. worry	*r*	0.076	−0.018	−0.044	0.003
	p	0.308	0.805	0.552	0.973
	df	181	181	180	181
PEA: Willingness to pay	*r*	0.213**	0.191**	0.105	0.226**
	p	0.004	0.010	0.160	0.002
	df	179	179	178	179
PEB: Transport	*r*	0.14†	0.071	0.058	0.111
	p	0.059	0.342	0.441	0.136
	df	181	181	180	181
PEB: Food	*r*	0.441***	0.358***	0.285***	0.319***
	p	0.000	0.000	0.000	0.000
	df	181	181	180	181
PEB: Waste	*r*	0.153*	0.164*	0.15*	0.168*
	p	0.04	0.028	0.044	0.024
	df	178	178	177	178
PEB: Engagement	*r*	0.255***	0.234***	0.216**	0.308***
	p	0.001	0.001	0.003	0.000
	df	180	180	179	180
OL: You, stand up	*r*	0.102	0.095	0.017	0.176*
	p	0.171	0.201	0.825	0.017
	df	180	180	179	180
OL: Sustainability at work	*r*	0.126†	0.101	0.125†	0.145†
	p	0.091	0.176	0.095	0.052
	df	179	179	178	179
OL: Influence level at work	*r*	0.148*	0.128†	0.269***	0.223**
	p	0.048	0.088	0.000	0.003
	df	176	176	175	176
OL: Top managem., stand up	*r*	0.196†	0.145	0.123	0.248*
	p	0.06	0.164	0.243	0.017
	df	91	91	90	91

OL, organizational level variable; FFMQ, Five Facets of Mindfulness Questionnaire; MHC, mental health continuum; PEB, pro-environmental behavior; PEA, pro-environmental attitudes.
[a]Partial correlations, adjusted for age and gender.
Note: *$p < 0.05$, **$p < 0.01$, ***$p \leqslant 0.001$, †$0.05 > p \leqslant 0.1$, two-tailed, df = degrees of freedom.

meditation led to significantly more prosocial reparation, mediated by increased 'other-focus and feelings of love'. The current study corroborates these earlier findings by, despite a rather limited sample and the cross-sectional design, highlighting the importance of duration and type of meditation.

4.2 Meditation practices: associations with transformative qualities, connectedness to nature, and mental wellbeing

Previous experience of the respective meditation practices, as well as the duration of practice, was positively associated with higher levels of mindfulness and mental wellbeing (mental health continuum). Yet, only moving meditation was related to (higher levels of) self-compassion and (lower levels of) perceived stress. Neither meditation practice type nor duration was associated with compassion toward others.

Furthermore, longer duration of meditation practice was associated with higher nature connectedness.

Several previous studies have shown that meditation can increase mental wellbeing (Carmody & Baer, 2008; Keng et al., 2011; Shapiro et al., 2008), which is in line with the current study. Furthermore, earlier research has also found that meditation training can increase compassion toward others (Condon et al., 2013; Weng et al., 2013), so the findings in the current study may be seen as somewhat surprising. However, since the type of meditation experience and practice was self-reported in the current study, the results should be interpreted with due caution.

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Table 3. Meditation practices: associations with transformative qualities/capacities and mental wellbeing, adjusted for age and gender[a]

Variable		Moving meditation	Relaxation meditation	Insight meditation	Meditation duration
Mindfulness FFMQ	*r*	0.347***	0.241*	0.225*	0.259*
	p	0.001	0.020	0.031	0.012
	df	91	91	90	91
Self-compassion	*r*	0.281**	0.076	0.152	0.079
	p	0.007	0.472	0.151	0.452
	df	90	90	89	90
Compassion toward others	*r*	0.191†	0.116	0.192†	0.167
	p	0.068	0.271	0.069	0.111
	df	90	90	89	90
Connectedness to nature	*r*	0.183	0.145	0.151	0.264**
	p	0.080	0.165	0.150	0.010
	df	91	91	90	91
Mental wellbeing (MHC)	*r*	0.189**	0.204**	0.244***	0.168*
	p	0.010	0.006	0.001	0.023
	df	181	181	180	181
Perceived stress	*r*	−0.203**	−0.1	−0.145†	−0.079
	p	0.006	0.180	0.051	0.289
	df	180	180	179	180

FFMQ, Five Facets of Mindfulness Questionnaire; MHC, mental health continuum.
[a]Partial correlations, controlling for age and gender.
Note: *$p < 0.05$, **$p < 0.01$, ***$p \leqslant 0.001$, † trend ($0.05 > p \leqslant 0.10$), two-tailed, df = degrees of freedom.

4.3 Transformative qualities, including connectedness to nature: associations with pro-environmental attitudes and behaviors, and mental wellbeing

The direction of the transformative quality compassion showed to be differentially associated with pro-environmental attitudes and behavior, as well as wellbeing, respectively.

Compassion toward others was positively associated with pro-environmental attitudes and behavior, but not wellbeing, whereas compassion toward oneself, that is, self-compassion, as well as dispositional mindfulness was positively associated with wellbeing, but not with pro-environmental attitudes and behavior.

Some previous studies have shown that dispositional mindfulness is associated with pro-environmental behavior (Geiger et al., 2019), and it has been suggested that mindfulness and compassion training have the potential to support transformative qualities and – through this – could support certain pro-environmental attitudes and behaviors across scales (Wamsler et al., 2021). However, Riordan et al. (2022) found that individuals who completed 8 weeks of mindfulness-based stress reduction training did not show measurable changes in eco-friendly attitudes and behavior, when compared with another active health promotion training group or a group who did not receive training. Furthermore, Karl and Stanley (2024) identified that certain aspects of dispositional mindfulness was related to lower levels of reported climate anxiety, which in turn was related indirectly to lower engagement in pro-environmental behavior. This may resemble our observation that self-compassion was associated with better wellbeing but not with pro-environmental attitudes and behavior. On the other hand, greater awareness of internal and external negative experiences was related to greater climate anxiety and greater engagement in collective action and personal pro-environmental behaviors (Karl & Stanley, 2024). This is also somewhat similar to our findings that compassion toward others was unrelated to wellbeing but was positively associated with more pro-environmental attitudes and behavior. These associations could potentially be explained by certain aspects of mindfulness such as better emotion regulation and meta-awareness, that might reduce informants' pro-environmental attitudes and behavior, maybe by decreasing the 'negative affective motivator'. Increased experienced negative affect, on the other hand, might increase pro-environmental behavior (Karl & Stanley, 2024).

In addition, recent research show that mindfulness sometimes serves as a self-confirmation process that reinforces prevailing values, expectations, and intentions (Frank et al., 2021) and may even amplify selfish tendencies in some people (Gebauer et al., 2018).

The current study hence adds to the literature supporting that the direction of compassion seems to be associated with different outcomes in terms of wellbeing, and pro-environmental attitudes and behaviors. The importance of the direction of compassion has been investigated previously, with differential characteristics between compassion toward others *vs* toward oneself (self-compassion) (Gilbert, 2019; Gilbert et al., 2011, 2017). Gilbert et al. (2011, 2017) have shown that the direction of compassion is differentially associated with, for example, wellbeing. This might explain why our current findings did not corroborate the results of some earlier studies, which found that helping others is associated with psychological and physiological benefits (Andersson et al., 2021, 2022; Brown & Kasser, 2015; Cosley et al., 2010; Martela & Ryan, 2016).

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Table 4. Associations between transformative qualities, mental wellbeing, pro-environmental attitudes and behaviors, controlling for age and gender[a]

Variable		Mindfulness FFMQ	Self-compassion	Other-directed compassion	Mental wellbeing (MHC)	Perceived stress
Mental wellbeing (MHC)	*r*	0.477***	0.559***	0.199†	.	.
	p	0.000	0.000	0.057	.	.
	df	91	90	90	.	.
Perceived stress	*r*	−0.44***	−0.613***	0.035	−0.338***	.
	p	0.000	0.000	0.742	0.000	.
	df	90	90	90	180	.
PEA: Climate Env. Worry	*r*	−0.014	−0.121	0.130	−0.096	0.207**
	p	0.895	0.249	0.218	0.197	0.005
	df	91	90	90	181	180
PEA: Willing-ness to pay	*r*	0.182†	0.089	0.200†	0.139†	0.002
	p	0.085	0.404	0.059	0.062	0.979
	df	89	88	88	179	178
PEB: Transport	*r*	0.153	0.174†	0.311**	0.119	−0.125†
	p	0.143	0.098	0.003	0.108	0.093
	df	91	90	90	181	180
PEB: Food	*r*	0.098	0.037	0.124	0.197**	−0.13†
	p	0.351	0.727	0.240	0.007	0.081
	df	91	90	90	181	180
PEB: Waste	*r*	0.145	0.139	0.307**	0.229**	−0.128†
	p	0.173	0.193	0.003	0.002	0.088
	df	88	87	87	178	177
PEB: Engagement	*r*	−0.043	−0.163	0.265*	0.128†	−0.042
	p	0.686	0.122	0.011	0.085	0.579
	df	90	89	89	180	179
OL: You: Stand up	*r*	−0.002	0.038	−0.002	0.254***	0.019
	p	0.986	0.724	0.987	0.001	0.798
	df	90	89	89	180	179
OL: Intention to integrate climate issues in work in next 12 months	*r*	−0.176†	−0.06	0.099	0.179*	0.007
	p	0.091	0.570	0.346	0.019	0.929
	df	91	90	90	168	167
OL: Influence level at work	*r*	−0.008	0.117	0.04	0.317***	−0.127†
	p	0.943	0.279	0.713	0.000	0.093
	df	86	85	85	176	175
OL: Sustainability at work	*r*	−0.067	0.082	0.069	0.207**	0.001
	p	0.528	0.445	0.517	0.005	0.992
	df	89	88	88	179	178
OL: Top management stand up	*r*	0.213*	0.227*	0.086	0.269**	−0.189†
	p	0.040	0.029	0.416	0.009	0.071
	df	91	90	90	91	90

OL, organizational level variables; FFMQ, Five Facets of Mindfulness Questionnaire; MHC, mental health continuum; PEB, pro-environmental behavior; PEA, pro-environmental attitudes.
[a]Partial correlations, adjusted for age and gender.
Note: *$p < 0.05$, **$p < 0.01$, ***$p \leqslant 0.001$, † trend ($0.05 > p \leqslant 0.10$), two-tailed, df = degrees of freedom.

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Table 5. Nature connectedness: associations with other transformative qualities, mental wellbeing, pro-environmental attitudes and behaviors, controlling for age and gender[a]

Variable	*r*	*p*	*df*
Mindfulness FFMQ	0.318**	0.002	91
Self-compassion	0.230*	0.028	90
Compassion toward others	0.287**	0.005	90
Mental wellbeing (MHC)	0.147	0.160	91
Perceived stress	−0.147	0.162	90
PEA: Climate env. worry	0.206*	0.048	91
PEA: Willingness to pay	0.344***	0.001	89
PEB: Transport	0.227*	0.028	91
PEB: Food	0.269**	0.009	91
PEB: Waste	0.371***	0.000	88
PEB: Engagement	0.366***	0.000	90
OL: To what extent do you: Stand up for climate and sust. issues at work	0.325**	0.002	90

Note: *$p < 0.05$, **$p < 0.01$, ***$p \leqslant 0.001$, two-tailed, df = degrees of freedom.
[a]Partial correlations with nature connectedness, controlling for age and gender.

4.4 Mental wellbeing and stress: associations with pro-environmental behaviors and sustainability integration at the organizational level

In the current study, better self-reported mental health was associated with more pro-environmental attitudes and behaviors, in line with prior observations of an association between wellbeing and sustainable behaviors (Zawadzki et al., 2020). Furthermore, higher mental health was also associated with a work situation where sustainability issues are integrated in the organization to a higher extent, with having a higher level of personal influence at work, standing up for climate action at work, having a top management that stands up for climate action at work, and having a higher intention to integrate climate and environment issues in the work during the coming 12 months. On the other hand, higher perceived stress was associated with higher climate anxiety, while only trends ($0.05 > p \leqslant 0.10$) were observed for pro-environmental behaviors, whereby higher perceived stress was related to less pro-environmental behavior.

Singer and Klimecki (2014) have shown that experiencing poor mental health, in terms of burnout or stress is associated with compassion fatigue and empathy fatigue, and our results imply that these mental states (that in themselves are related to stress) could have an impact on pro-environmental attitudes and behavior. Furthermore, fatigue and low motivation is often a problem and an inherent part of mental health conditions like burnout, exhaustion, and depression, which could prevent engagement in societal issues like climate and environmental action. Poor mental health could thus obstacle pro-environmental behavior. However, it is also quite plausible that mental health and wellbeing is positively affected by being engaged in important social issues like pro-environmental action in private life and at work, for example, via meaningfulness and 'warm glow', and that being in a work context where you have an influence and where others in the organization (including top management) also stand up for climate and environment issues has a positive impact on mental health, as the observed association in the current study may indicate (e.g. Zawadzki et al., 2020). The causal relationship between mental health and pro-environmental behaviors may as such be bi-directional. However, due to the cross-sectional design, conclusions regarding causality cannot be drawn in the present study, which should be investigated in future studies.

Regarding the differences in robustness of associations between mental wellbeing and perceived stress on the one hand, and pro-environmental behavior on the other, this could potentially partly be due to measurement. The mental health questionnaire consisted of 14 items, conferring a more reliable measure of mental health and wellbeing, as well as greater variability in the mental wellbeing measure, compared to the single-item used to measure perceived stress.

4.5 Nature connectedness: associations with other transformative qualities and pro-environmental behaviors

Greater nature connectedness, conceptualized as another transformative quality, was associated with more pro-environmental attitudes and behavior. Nature connectedness was also associated with higher levels of mindfulness facets, compassion toward others, and self-compassion. However, nature connectedness was not associated with practicing any specific meditation type, wellbeing nor perceived stress.

Connectedness to nature hence stood out as a robust predictor across different pro-environmental attitudes and behaviors, including higher personal engagement in sustainability issues (e.g. willingness to pay/make sacrifices for the environment) and engagement in climate and sustainability issues at the organizational level/at work, as well as higher levels of the other transformative qualities. Connectedness to nature has previously been associated with pro-environmental attitudes and behaviors, and is enhanced by nature contact (e.g. Capaldi et al., 2014; Mayer et al., 2009; Nisbet & Zelenski, 2011). Interestingly, Apaolaza et al. (2022) found that mindfulness correlated with pro-environmental behavior through cognitive reappraisal and climate change awareness. When people reported higher nature connectedness, the impact of mindfulness on pro-environmental behavior decreased. The authors hence concluded that nature connectedness diminished the need of mindfulness for pro-environmental behavior.

Facilitating and supporting human–nature contact in daily life, strengthening the understanding and valuing of nature, with all its eco-system services affecting human well-being and livelihood directly and indirectly, is thus a key in enhancing both humans' caring relationship to nature, including pro-environmental attitudes and behaviors. Here, we also find that nature connectedness is associated with mindfulness facets/processes and compassion toward others – other transformative qualities which we found to be important for pro-environmental behaviors. It has previously been found that nature connectedness can support a shift in perspectives away from the self and toward the greater whole (Bratman et al., 2019; Zhang et al., 2014). The present study extends such prior results, in finding that nature connectedness is also associated especially with compassion toward others, while also supporting compassion toward the self.

Aligning with the results of the current study, Thiermann et al. (2020) recently showed that advanced meditators who reported high levels of connectedness with nature, subjective happiness, and dispositional mindfulness showed significantly more concern for the environment.

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Table 6. Sustainability integration and efforts at work: associations between pro-environmental behaviors at different levels in the organization[a]

Variable		Your top managem.: stand up	Your direct managem.: stand up	Your peers: stand up	Staff reporting to you: stand up	You: stand up	Sust. at work	Influence at work
Your direct management: stand up for climate and sust. at work	*r*	0.451***	.	.	.	.	.	.
	p	0.000	.	.	.	.	.	.
	df	92	.	.	.	.	.	.
Your peers: stand up for climate and sust. at work	*r*	0.407***	0.539***	.	.	.	.	.
	p	0.000	0.000	.	.	.	.	.
	df	93	92	.	.	.	.	.
Staff reporting to you: stand up for climate and sust. at work	*r*	0.320**	0.474***	0.549***	.	.	.	.
	p	0.003	0.000	0.000	.	.	.	.
	df	87	86	87	.	.	.	.
You: stand up for climate and sust. at work	*r*	0.353***	0.514***	0.401***	0.532***	.	.	.
	p	0.000	0.000	0.000	0.000	.	.	.
	df	94	92	93	87	.	.	.
Sustainability at work (high score, high integration)	*r*	0.313**	0.523***	0.601***	0.563***	0.431***	.	.
	p	0.002	0.000	0.000	0.000	0.000	.	.
	df	93	92	87	93	183	.	.
Influence level at work (high score high infl.)	*r*	0.209*	0.302**	0.434***	0.241*	0.252***	0.490***	.
	p	0.048	0.004	0.000	0.023	0.001	0.000	.
	df	90	88	83	89	179	179	.
Intention to integrate climate issues in work in next 12 months	*r*	0.056	0.121	0.410***	0.251*	0.459**	0.566***	0.363***
	p	0.592	0.249	0.000	0.015	0.000	0.000	0.000
	df	95	92	87	93	171	170	167

Note: *$p < 0.05$, **$p < 0.01$, ***$p \leqslant 0.001$, two-tailed, df = degrees of freedom.
[a]Spearman's rho, non-parametric correlations.

4.6 Engagement at collective/organizational levels (i.e. at work)

Previous experience of all types of meditation practices, and having practiced for a longer time, as well as compassion toward others, were associated with higher general engagement in climate and environment issues. Duration of meditation practice and insight meditation was associated with personal engagement at collective/organizational levels, as well as the extent to which the respondent's top management and leaders stand up for climate and sustainability at work. This finding supports the model suggested by Wamsler et al. (2021) that mindfulness and compassion training have the potential to support certain pro-environmental attitudes and behaviors across scales and contexts.

The degree of actual integration of sustainability work in the organization that people work within was associated with the degree to which people at all different levels in the organization stand up for climate and sustainability issues, including from top management to peers, to the personal individual. Furthermore, the extent to which top management and leaders in the organization, direct managers, staff, and the individual stand up for climate and sustainability issues at work, were all associated. This is in line with previous work highlighting the role of mainstreaming sustainability work, through both bottom-up and top-town processes of exchange, inspiration, and motivation, showing that employees are motivated by developing and maintaining mutual beneficial exchanges over time (Paillé & Meija-Morelos, 2019). Also, the results regarding engagement at collective/organizational levels indicate social norms (Yamin et al., 2019) and behavior contagion (Zorell, 2020) as important determining factors of the integration of climate and sustainability issues throughout an organization.

4.7 Strengths and limitations

A strength of the study is that it contributes to filling a gap in the empirical literature on the nexus of inner qualities and transformative processes and outer, pro-environmental, behaviors for sustainable change. Since there is no specific questionnaire that measures particularly what the current study focused on (inner-outer changes regarding sustainability at different levels), and quantitative measurements on this topic are very limited, a new set of questions was thus necessary. The study hence utilized a combination of existing traditional and adapted measures, to capture especially relevant pro-environmental attitudes and behaviors. This in turn can contribute to advance methods for identifying inner–outer transformation.

The recent IPCC report (2022b) underscores the need for value- and action-oriented research that employs inter- or transdisciplinary methods such as, for example, transactional psychology and transformative science. Such research emphasizes how changes in individual beliefs could lead to climate actions that contribute to more sustainable, equitable, and just societies. The findings of the current study confirm the suggested processes and provide a more detailed understanding of linkages across behavior and engagement across different scales.

There are also some limitations of the study design that should be considered when interpreting the results. First, causality cannot be inferred due to the cross-sectional research design. Secondly, the relatively small sample size reduces statistical power. Future studies should aim for a larger sample size, both for replication purposes as well as facilitating even more fine-grained analyses of the determinants of pro-environmental attitudinal and behavioral outcomes. Thirdly, sustainable behaviors at both the individual and organizational level were assessed using self-report measures, which can be susceptible to, for example, social desirability bias, misperception, and misinterpretation. To address these limitations and increase construct validity, future research could advance the field by focusing on and directly measuring actual pro-environmental behaviors. Finally, in order to reduce the total number of questions and minimize the risks of scale overload or attrition, we had to select single items from established questionnaires in some cases. The risk of scale overload is well-known in different research areas, and there are some theoretical and practical pros and cons regarding such selections coming from fields that are rather critical in this respect. The use of for example single-item measures has been recommended, if they are concrete and when the selection of them is theoretically anchored on the basis of the research aim and questions, whilst considering the construct/trait/state they aim to capture (Fisher, 2016; Nair et al., 2016).

4.8 Future directions

Future research should consider employing behavioral measures of pro-environmentalism or experiments to assess the actual behavior (or willingness) to take action. For addressing such research questions, longitudinal studies would be highly valuable. The incentive to perform intervention studies including compassion exercises is supported by recent research that suggests that the different directions of compassion can be cultivated with training (Condon et al., 2013; Gilbert, 2019, Gilbert et al., 2017) and that greater altruistic behavior may emerge from increased engagement of neural systems implicated in understanding the suffering of other people, executive and emotional control, and reward processing (Weng et al., 2013).

There is also a need for combining quantitative with qualitative studies to understand how changes at individual level translate into engagement at collective/organizational and system levels and for understanding the emergence of change toward sustainability (as opposed to a limited understanding of cause-and-effect relationships).

Furthermore, since there has been an over-emphasis on belief-related outcomes in a majority of contemporary mindfulness research (Wamsler et al., 2021), a shift toward (or at least complementing with) engagement-related outcomes should be a critical step in order to advance the field. The present study aimed to contribute to this advancement.

Intervention studies should take the type of meditation into account, and aim for exercises that include both moving and insight, as well as compassion toward others and oneself, and evaluate this further (Jansen et al., 2024; Riordan et al., 2022; Woiwode et al., 2021), as well as include and test measures of connectedness to nature (Apaolaza et al., 2022) in order to provide guidance for optimizing contemplative approaches that can support pro-environmental behavior and sustainability at individual and collective levels.

Furthermore, implementation studies on mainstreaming sustainability efforts and climate action in organizations are essential to increase the speed and scale of the necessary transformation toward sustainability, particularly with regards to aligning human activities with the planetary boundaries (IPBES, 2024).

Supplementary material. The supplementary material for this article can be found at https://doi.org/10.1017/sus.2025.15.

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