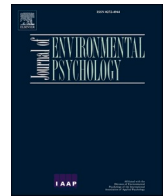**Universidades Lusíada**

Moreira, Paulo
Inman, Richard A.
Hanel, Paul H. P.
Faria, Sara
Araújo, Marta
Pedras, Susana
Cunha, Diana

Engagement and disengagement with sustainable development : further conceptualization and evidence of validity for the Engagement/ Disengagement in Sustainable Development Inventory (EDiSDI)

Metadados

Data de Publicação	2022
Resumo	Engagement is a multidimensional construct with emotional, cognitive, and behavioral components. As a process, engagement captures how subjective experiences result from interactions between perceptions, information-processing and ecological influences in a way that activates internal states to maintain behavior. This process underlies the way people relate to different contexts, topics or issues. Engagement is highly responsive to contextual factors and a good predictor of desirable outcomes. T...
Editor	Elsevier
Palavras Chave	Engagement, Disengagement, Sustainable development, Bifactor model, Cross-cultural, Validity
Tipo	article
Revisão de Pares	yes
Coleções	[ILID-CIPD] Artigos

Engagement and disengagement with Sustainable Development: Further conceptualization and evidence of validity for the Engagement/ Disengagement in Sustainable Development Inventory (EDiSDI)

Paulo A.S. Moreira [a,b,*], Richard A. Inman [a], Paul H.P. Hanel [c], Sara Faria [a], Marta Araújo [a], Susana Pedras [a], Diana Cunha [a]

[a] *Centro de Investigação em Psicologia para o Desenvolvimento (CIPD) [The Psychology for Positive Development Research Center], Universidade Lusíada, Porto, Portugal*
[b] *Instituto de Psicologia e de Ciências da Educação (IPCE), Universidade Lusíada, Porto, Portugal*
[c] *Department of Psychology, University of Essex, Colchester, United Kingdom*

ABSTRACT

Engagement is a multidimensional construct with emotional, cognitive, and behavioral components. As a process, engagement captures how subjective experiences result from interactions between perceptions, information-processing and ecological influences in a way that activates internal states to maintain behavior. This process underlies the way people relate to different contexts, topics or issues. Engagement is highly responsive to contextual factors and a good predictor of desirable outcomes. Therefore, engagement with sustainable development has strong potential as a locus for intervention and research addressing sustainable development issues. However, research on engagement (and disengagement) with sustainable development is nascent and there is a need to bolster evidence on the psychometric adequacy of its associated measure. In this study, we analyzed data from four independent samples, all of which completed the Engagement/Disengagement with Sustainable Development Inventory (EDiSDI). The study has five major findings: (1) A bifactor model was replicated in multiple samples, thus confirming structural validity. (2) EDiSDI scores correlated with related constructs in a theoretically consistent manner, thus confirming convergent validity. (3) EDiSDI scores predicted variance in pro-sustainability behavior, hence demonstrating predictive validity. (4) The EDiSDI had measurement invariance across age, society, and gender. (5) A general factor reflecting engagement accounted for the majority of variance in items designed to measure various constructs that capture the way humans relate to sustainable development issues. A major contribution of this study is that it supports an integrative framework for conceptualizing two major expressions of how people relate to sustainable development: engagement and disengagement. Future research can use the EDiSDI to build knowledge on how engagement and disengagement can explain sustainable and unsustainable (e.g. negationist) behavioral patterns. This will be important for helping inform policies and practices for promoting sustainable behavioral patterns in citizens of different societies.

1. Introduction

Human activities toward the satisfaction of societal needs have been largely unsustainable because they have not guaranteed the preservation of the vital resources necessary for future generations (IPCC, 2014, 2021). Consequently, a pressing societal challenge is to work toward Sustainable Development (UN, 2015; WCED, 1987). Sustainable development, defined as "development that meets the need of the present generation without comprising the ability of future generations to meet their own needs" (WCED, 1987, p. 41), is a broad and multidimensional concept incorporating various distinct yet interconnected issues. These issues are grouped within three major domains: environmental,

---

economic, and societal (Atkinson, Dietz, & Neumayer, 2007). Behavioral change, both at the individual and collective levels, is key to promoting sustainable development in these domains (Gardner & Stern, 2008). Thus, research in the behavioral sciences into how best to promote change in peoples' behavioral systems[1] is key to informing the design and implementation of any approach to promoting sustainable development (Stern, 2011).

1.1. Promoting sustainable behavior: A need to focus on the processes that underlie all types of sustainable behavior

In the pursuit of sustainable development, researchers from the behavioral sciences have typically sought to demonstrate how specific constructs and theoretical frameworks can predict personal behaviors that are either beneficial or detrimental to sustainable development (Nielsen et al., 2021; Stern, 2011). Constructs with predictive validity can then serve as a locus for intervention. Myriad constructs and theories relevant to diverse sustainable development issues have now been proposed and evaluated in prior works. Many of these constructs share at least one of two characteristics: a) they are relevant to understanding how humans relate to specific aspects of sustainable development rather than sustainable development as a holistic topic; and (b) they offer only a partial account of the psychological mechanisms that underlie how humans relate to sustainable development issues.

Although psychological research is abundant with constructs that could serve as potential targets for intervention, many have a narrow focus on specific aspects of sustainable development. A substantial number of constructs specifically address how humans relate to their natural environments and are therefore particular to environmental sustainability. This includes environmental identity (Clayton, 2003), nature relatedness (Nisbet, Zelenski, & Murphy, 2009), and environmental consciousness (Sharma & Bansal, 2013), among others. As a result, the various competing frameworks and their resulting instruments and interventions are context-dependent and only suitable for certain topics (Gericke, Boeve-de Pauw, Berglund, & Olsson, 2019). This narrow focus results in an approach that does not recognize sustainable development as a complex issue with interacting environmental, social and economic factors. Recently, researchers have taken a broader perspective and turned their attention to the way humans relate to sustainability as a holistic topic (e.g., Biasutti & Frate, 2017; Gericke et al., 2019). However, like many of the domain-specific constructs, these are from theoretical frameworks that do not fully capture the complex underlying dynamics that account for how humans relate to sustainable development issues.

Given this state of the art, and the broad and complex nature of sustainable development, there is a need to develop new theoretical frameworks and identify psychological constructs that predict patterns of sustainable behavior. For this global approach to be effective, it is necessary that such frameworks capture the common basic psychological mechanisms that shape how individuals experience and relate to their external environments and influence sustainable behavior broadly over time (as opposed to specific processes that explain narrow behavioral expressions). This overall reflection of human functioning can be conceptualized as a single overarching construct with multiple lower-level components. This is analogous to a dominant general factor that explains common variance in the way people experience and relate to the various environmental, social, and economic sustainability issues. Dominant general factors are pervasive in psychological research including on cognitive ability (Carroll, 1993; Jensen, 1998), personality (Just, 2011) and psychopathology (Caspi et al., 2014). The fact that multiple constructs capturing connection to nature have been found to

converge to a single factor (Tam, 2013) suggests that commonalities among the constructs can account for significant variance in the way humans relate to environmental sustainability. Critically, general factors are typically the predominant source of predictiveness across constructs and can be measured consistently across measures, contexts, and methods (Ree, Carretta, & Teachout, 2015).

1.2. Engagement: A theoretical framework

Over the last 30 years, the construct of engagement has received substantial attention because it has been consistently demonstrated as a strong enabler of adaptive and desirable behaviors and associated outcomes. As such, the engagement literature has a rich understanding of the features of engagement:

1.2.1. Multidimensionality

Historically, research on engagement has been hindered by the lack of a clear consensus over the definition of engagement. For example, across literatures engagement has been defined in terms of (a) overt behavioral indicators such as participation in activities (Natriello, 1984) or sustained behavioral involvement (Alisat & Riemer, 2015; Kaiser & Byrka, 2011; Wray-Lake, DeHaan, Shubert, & Ryan, 2019); (b) a combination of attitudes and participatory behaviors (Milfont & Sibley, 2012); (c) a positive affective-cognitive experience characterized by confidence, vigor, dedication and enthusiasm (Lonsdale, Hodge, & Raedeke, 2007; Schaufeli, 2013); (d) psychological processes involving attention, investment, and effort (Marks, 2000), and (e) a 'psychological presence' involving attention and absorption (Rothbard, 2001).

Despite this ambiguity, it is now typically recognized that engagement is a multidimensional construct with distinct-yet-interrelated *emotional*, *cognitive*, and *behavioral* components (Bobek, Zaff, Li, & Lerner, 2009; Fredricks & Paris, 2004; Kahn, 1990; Zaff, Boyd, Li, Lerner, & Lerner, 2010). More specifically, these dimensions capture how different components of subjective experiences result from interactions between perceptions, information-processing and ecological influences in a way that activates internal states to maintain behavior (Moreira, Cunha, et al., 2020). A recent person-centered study found that engagement was optimized when participants' habits and dispositional emotional tendencies were persistently regulated by sociocognitive processes; with interactions between dispositional tendencies to maintain behavior and intentional self-regulation proving particularly relevant (see Section 1.2.5, Moreira, Inman, Cloninger, & Cloninger, 2021).

Several reviews provide detailed discussions of the three engagement dimensions and their varying definitions across the literature (for example, Fredricks & Paris, 2004). However, in summary, behavioral engagement captures observable behaviors that reflect active participation in a context/topic (Alisat & Riemer, 2015; Nguyen, Cannata, & Miller, 2018); emotional engagement captures positive affective reactions to a context/topic (Connell & Wellborn, 1991) and a sense of belonging and identification (Appleton, Christenson, Kim, & Reschly, 2006); and cognitive engagement captures positive perceptions, attitudes, and beliefs about a context/topic (Jimerson, Campos, & Greif, 2003; Milfont & Sibley, 2012), as well as being self-regulated and psychological invested (Fredricks & Paris, 2004).

1.2.2. Responsive to internal and external factors

Engagement is typically conceptualized as a context-dependent construct that is responsive to internal and external factors (Meyer & Gagné, 2008; Wang, Degol, & Henry, 2019). Consequently, engagement is expected to be a malleable construct, and thus an ideal target for intervention. This theoretical proposition is supported by cross-sectional and longitudinal evidence across diverse literatures. For example, various structural features of an individual's environment have been linked to differences in engagement (Jang, Reeve, & Deci, 2010; Wang & Degol, 2014). Additionally, evidence has shown that individuals tend to

---

[1] 'Behavioral system' refers to patterns of actions and their underlying psychological processes (Gardner & Stern, 1996; Gifford, Kormos, & McIntyre, 2011).

be more engaged when they feel more supported, autonomous, and competent, including in studies focused on engagement in sustainable development (Inman, Moreira, Faria, Pedras, & CorreiaLopes, 2021), job engagement (Van Den Broeck, Vansteenkiste, De Witte, & Lens, 2008), civic engagement (Wray-Lake et al., 2019) and athlete engagement (Hodge, Lonsdale, & Jackson, 2009).

1.2.3. Predictive of relevant outcomes

Myriads of studies have demonstrated the predictive power of engagement and its component dimensions for explaining human functioning and developmental outcomes. For example, research in occupational psychology has shown that work engagement significantly predicts reductions in work absence (Soane et al., 2013) and improved task performance at work (Christian, Garza, & Slaughter, 2011). Various studies have shown that behavioral engagement in environmental issues (such as engaging in eco-behaviors), and civic engagement as a broader construct, are linked to heightened wellbeing (Brown & Kasser, 2005; Venhoeven, Bolderdijk, & Steg, 2013; Wray-Lake et al., 2019). Athlete engagement in elite sport has been found to be predictive of desirable performance-related variables such as state flow (Hodge et al., 2009). Finally, engagement with school has been shown to be predictive of relevant educational outcomes (Fall & Roberts, 2012; Lee, 2014; Li & Lerner, 2011).

1.2.4. Disengagement

A substantial body of research has focused on describing the psychological processes and socio-contextual antecedents that promote engagement. Consequently, there is now a good understanding of how and why individuals relate in a positive way to various contexts or topics. In comparison, research has focused relatively little on what it means to be disengaged. That said, major theories of developmental regulation (such as the *Motivational Theory of Life-Span Development* of Heckhausen, Wrosch, & Schulz, 2010) have defined disengagement as the intentional self-regulatory capacity to distance oneself from unattainable goals. Thus, disengagement implies intentionally reducing and eventually stopping effort and commitment (time and energy) toward a target goal (Brandstätter & Bernecker, 2022; Wrosch, Scheier, Miller, Schulz, & Carver, 2003). Defined this way, disengagement refers to the process of withdrawing one's engagement, implying that the state of being disengaged reflects the absence of engagement. Consistent with this, many engagement theorists have defined disengagement as the conceptual opposite of engagement, albeit as an unconscious and unintentional expression of psychological processes rather than an intentional strategy. In this way, indicators of disengagement have included a lack of behavioral effort or persistence, disaffected thoughts (mental withdrawal and lack of attention), and disaffected emotions such as anxiety, sadness, and boredom (Skinner, Kindermann, & Furrer, 2009). Only more recently has disengagement been defined as a distinct construct from engagement, reflecting the presence of maladaptive processes and states that are not evident in the absence of engagement (Afrahi, Blenkinsopp, Fernandez de Arroyabe, & Karim, 2021; Kahn, 1990; Moreira, Ramalho, & Inman, 2020; Wang, Fredricks, Ye, Hofkens, & Linn, 2019). This aligns with a current consensus that accurate models of human behavior need to acknowledge the complex interactions between psychological mechanisms underlying positive and negative functioning (Moreira et al., 2020; Moreira, Inman, & Cloninger, 2021b). However, research on engagement has not yet been able to offer a clear picture of the maladaptive processes underpinning disengagement.

1.2.5. Engagement and disengagement as expressions of dynamic interactions between psychobiological processes

Recent empirical findings suggest that engagement and disengagement are dependent on dynamic interactions between psychobiological processes that are extensively supported by neurobehavioral, neurogenetic and evolutionary studies (e.g., Zwir et al., 2019; 2020a; 2020b, 2021). In a study by Moreira et al. (2021), psychobiological processes

linked to traits for being determined, ambitious, enthusiastic, responsible and resourceful had the strongest positive correlations with engagement. In turn, processes underpinning traits for being impulsive, exploratory, pessimistic and fearful had negative correlations with engagement. In short, this finding implies that engagement is more phenotypical of individuals with dispositional tendencies for behavioral maintenance (i.e. persistence). Moreover, the study indicated that self-regulatory sociocognitive processes serve to direct and guide dispositional tendencies in accordance with goals and values. Hence, engagement emerges most optimally when dispositional tendencies for behavioral maintenance are directed toward a context or topic in accordance with personal goals and values.

Conversely, the findings of Moreira et al. (2021) suggested that disengagement emerges when emotional tendencies for exploration and/or inhibition go unregulated and become a strong influence against engagement in different contexts. This is supported indirectly by research into the psychobiological underpinnings of reactance (Hong, Giannakopoulos, Laing, & Williams, 1994; Hong & Page, 1989; Moreira, Cunha, & Inman, 2020a) and resistance to change (Oreg, 2003), both of which are expressions of maladaptive functioning and related to psychobiological processes that maintain undesirable or non-conformist attitudes and behaviors (Inman, Sousa, Cunha, & Moreira, 2019; Moreira, Inman, & Cloninger, 2021a; Moreira, Inman, & Cunha, 2020). More direct support comes from a recent person-centered study (Moreira et al., 2020). In this study, individuals who were classified as being actively involved in changing their behavior were high in engagement, and this was associated with psychobiological mechanisms for wellbeing and the deep approach to learning including persistence and higher-order socio-cognitive processes. In turn, individuals classified as being resistant to changing their behavior had low scores for engagement, and this was associated with psychobiological mechanisms underpinning impulsivity, excitability, and being easily discouraged, underachieving, blaming and aimless. In a similar type of person-centered analysis, adults and adolescents classified as being resistant to changing their behavior to tackle climate change reported the highest scores for emotional, cognitive and behavioral disengagement with sustainable development (Inman et al., 2021). It is noteworthy that the intentional self-regulatory strategy of disengagement described by theories of developmental regulation theories (Brandstätter & Bernecker, 2022) corresponds to when dispositional tendencies for behavioral maintenance are directed away from a context of topic in accordance with personal goals and values. Thus, this self-regulatory strategy more accurately reflects a process of 'engagement withdrawal' rather than the process of disengagement.

1.3. Engagement and disengagement with Sustainable Development and the EDiSDI

Guided by the theoretical framework presented in Section 1.2, Moreira and colleagues (Moreira, 2020; Moreira et al., 2020) proposed the multidimensional constructs of engagement and disengagement with sustainable development. Engagement with sustainable development manifests when a person's subjective experiences of sustainable development interact with external factors to shape perceptions and information-processing in a way that activates internal states to maintain pro-sustainable behavior. Based on the outlined framework, engagement with sustainable development is theorized to be multidimensional, highly context-dependent, and predictive of distal sustainable development outcomes (such as public activism, active citizenship, support for sustainable policies, and personal lifestyle changes; Stern, Dietz, Abel, Guagnano, & Kalof, 1999) over time. As such, this construct holds strong potential as a locus for interventions aiming to promote the uptake of sustainable behavior. Moreover, engagement with sustainable development is expected to be related, yet conceptually distinct, from disengagement with sustainable development (which itself reflects disaffection with, and withdrawal of involvement from, sustainable

development issues). Supporting this hypothesis, recent work has shown that engagement and disengagement with sustainable development are independent dimensions interrelated in a two-dimensional circumplex model; that is, it is possible for people to simultaneously display high engagement and high disengagement (Inman et al., *submitted*).

Moreira et al. operationalized engagement and disengagement with sustainable development in the form of the EDiSDI (Moreira et al., 2020). By measuring the emotional, cognitive and behavioral dimensions of engagement and disengagement, the EDiSDI aims to capture the common psychological mechanisms that underlie the way humans relate to all sustainable development issues. This resulted in a multidimensional scale with six sub dimensions: *emotional engagement* (indicators include positive affective reactions toward sustainable development and sense of connectedness with sustainable development), *cognitive engagement* (adaptive beliefs and appraisals about sustainable development, as well as cognitive investment), *behavioral engagement* (behavioral involvement with sustainable development), *emotional disengagement* (disaffection and maladaptive affective reactions toward sustainable development), *cognitive disengagement* (maladaptive beliefs and appraisals about sustainable development), and *behavioral disengagement* (withdrawal of behavioral involvement with sustainable development and/or involvement in unsustainable behavior). A psychometric investigation of the EDiSDI supported a bifactor model comprising two general factors (engagement and disengagement) and six specific factors (Moreira et al., 2020) (Fig. 1). Despite capturing psychological processes that are common across sustainable development domains, items of the EDiSDI are oriented toward environmental sustainability. Consequently, convergent validity has so far been established by demonstrating strong positive correlations with environment-related constructs including nature relatedness, environmental identity, and environmental action (Moreira et al., 2020).

Because sustainable development is a global challenge, an important unanswered question is whether the EDiSDI can be used to compare engagement and disengagement with sustainable development across heterogeneous groups. At present, psychometric evidence for the EDiSDI is limited to two relatively small adult samples from Portugal. The EDiSDI cannot yet be used to infer real group differences without determining whether its component constructs have an equivalent meaning across groups of interest (Milfont & Fischer, 2010). Moreover, without measurement invariance the EDiSDI cannot be used reliably to assess the effectiveness of interventions across groups (Putnick &

Bornstein, 2016). Consequently, a key task in promoting sustainable behavior is to establish whether the EDiSDI has semantic equivalence across diverse groups. This is particularly relevant for researchers interested in the engagement of youth and adolescents with sustainable development, or how different societal groups differ in engagement with sustainable development.

1.4. The present study

The objective of this multi-sample study was to develop psychometric evidence for the EDiSDI. A robust body of evidence demonstrating the suitability and adequacy of this measure is fundamental for the development of valid scientific research and, more critically, for assessing the effectiveness of policy and interventions for promoting sustainable behavior in all people.

The study had several specific aims: 1) To confirm structural validity by testing whether the bifactor model identified by Moreira, Ramalho et al. (2021) replicates in diverse samples. 2) To confirm convergent validity by assessing the degree of association between EDiSDI scores and theoretically related constructs. 3) To test whether the EDiSDI has predictive validity; that is, whether participants' EDiSDI scores predict significant variance in sustainable behavior. 4) To confirm whether the EDiSDI has measurement invariance across heterogeneous groups differing in age, society, and gender. 5) To test the extent to which various constructs describing how humans relate to sustainable development issues converge to a single general factor representing a common psychological process (i.e. that of engagement).

2. Methods

2.1. Participants and procedures

Table 1 summarizes the main characteristics of the four study samples.

2.1.1. Sample 1

Sample 1 comprised 3259 adolescents (7th/8th graders) who were participants in the first wave of The Portuguese Longitudinal Study of Student Engagement with Sustainable Development (Moreira, 2017). These adolescents were recruited from 83 schools across Portugal. All individuals completed the pen and paper format questionnaires
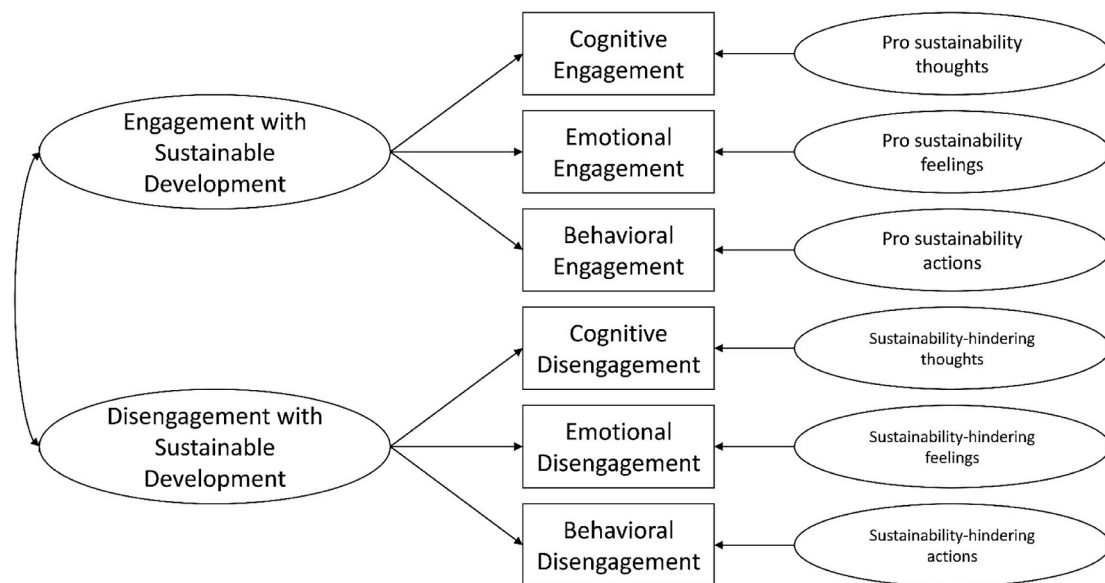

Fig. 1. Bifactor model with two general factors and six specific factors. Rectangles reflect sets of EDiSDI items. Ovals reflect latent constructs. Specific factors (far right ovals) are not conceptually or mathematically equivalent to first-order factors, and therefore have different labels.

Table 1
Summary of the four study samples.

Sample	Total *N* (after exclusions[a])	Year of data collection	Age M (SD)	Gender (M/F)	Details	EDiSDI version	EDiSDI Internal Consistency (ω)	Other Measures (ω)	Analyses
Sample 1 (Adolescents; Portugal)	3259	2019	13.38 (0.67)	46.9%/ 49.7%	Students in 7th grade for the 2018/2019 academic year	Portuguese language EDiSDI (30 items); pen-and-paper format	Engagement = .92 Disengagement = .91	EA = .97 EID = .93 NR = .88 PSB = .70	CFA, MGCFA, Linear Regression
Sample 2 (Adults; UK)	300	2020	19.76 (2.77)	25.7%/ 73.7%	Psychology undergraduates at a UK University	English language EDiSDI (27 items); online format	Engagement = .90 Disengagement = .88	EA = .93 BIO = .91 ALT = .79	CFA, MGCFA
Sample 3 (Adults; Portugal)	324	2019	47.88 (6.86)	21.0%/ 78.4%	Schoolteachers of Sample 1	Portuguese language EDiSDI (30 items); pen-and-paper format	Engagement = .92 Disengagement = .89	EA = .94 EID = .92 NR = .90 PSB = .76	CFA Linear Regression
Sample 4 (adults; Portugal)[b]	289 + 510 = 799	2019 + 2018	34.03 (12.58)	34.7%/ 62.3%	59.6% Employed; 25.8% Full-time university students; 6.6% Unemployed; 2.8% Retired	Portuguese language EDiSDI (Pilot version, 99 items); online format	Engagement = .97 Disengagement = .97	–	MGCFA

Note. EA = Environmental Action Scale; EID = Environmental Identity Scale; NR = Brief Nature-Relatedness Scale; PSB = Pro-Sustainability Behaviors; BIO = Biospheric values; ALT = Altruistic values; CFA = Confirmatory Factor Analysis; MGCFA = Multi-group Confirmatory Factor Analysis.

[a] For pen-and-paper format studies, participants were included in the sample if they responded to at least 75% of items for any of the study measures. For online studies, participants were unable to submit responses with missing data, and so no participants were excluded.

[b] samples from Moreira et al. (2020)

independently during class, supervised by a class teacher or researcher. Participants responded to the measures considered in this study in a single session.

2.1.2. Sample 2

Sample 2 (*n* = 300) was a sample of Psychology undergraduate students from a University in the UK. These participants completed an online survey, which they could access at their convenience, via a shared link. For these participants, completing online Psychology experiments was a component of their degree course.

2.1.3. Sample 3

Sample 3 (*n* = 324) comprised adults who were also participants in the first wave of The Portuguese Longitudinal Study of Student Engagement with Sustainable Development (Moreira, 2017). Specifically, these adults were the schoolteachers of the adolescents in Sample 1. These teachers were asked to complete a battery of questionnaires, in a pen-and-paper format, independently and at their convenience.

2.1.4. Sample 4

Sample 4 (*n* = 799) was a combination of the two independent adult samples from Portugal (Moreira et al., 2020). Portuguese adults were recruited using a snowball sampling method. Initially, undergraduate psychology students at the authors' university were invited to participate in the online study. Participants were able to access the online materials, at their convenience, via a shared link. Participants were asked to share the link with family and friends aged 18 years or older. No reward or compensation was given for participation. These participants could not submit their online responses without providing an answer for all items.

2.1.5. Ethical issues

Data collection for all samples was performed according to the ethical principles of the Declaration of Helsinki. Ethical approval to collect data from the Portuguese samples was granted by the ethics committee at Universidade Lusíada. Ethical approval to collect data from the sample from the UK was given by the ethics committee at the University of Essex [ETH1920-0951]. Participants could only be involved in the study if they signed and returned an informed consent form. Subjects younger than 18 were also required to provide a signed informed consent from a parent/legal guardian.

2.2. Measures

The four samples completed different surveys, each assessing a range of constructs. However, several measures were common across samples. Omega values for these scales across samples are shown in Table 1.

2.2.1. EDiSDI (all samples)

We assessed engagement and disengagement with sustainable development using the EDiSDI (described in detail in **Section** 1.3; Moreira, 2021; Moreira, Ramalho & Inman, 2021). The four samples responded to various versions of the EDiSDI (see Table 1). However, for all samples we considered the same 27 items validated by Moreira, Ramalho et al. (2021): cognitive engagement (3 items), emotional engagement (4 items), behavioral engagement (5 items), cognitive disengagement (8 items), emotional disengagement (3 items), and behavioral disengagement (4 items). Items were scored on a five-point scale from 1 (*Totally False*) to 5 (*Totally True*).

2.2.2. Environmental Action Scale (samples 2 and 3)

Environmental action was measured using the Environmental Action Scale (EAS; Alisat & Riemer, 2015). This instrument, designed for people aged 16 years+, measures involvement in civic activities aiming to address environmental issues (e.g., "Financially supported an environmental cause"). This 18-item scale comprises two subscales that capture (a) leadership actions and (b) participatory actions. However, we calculated and used a composite mean score representing total environmental action. Items are scored on a 5-point scale from 0 (*never*) to 4 (*frequently*).

2.2.3. Environmental identity (EID) scale (samples 1 and 3)

Environmental identity reflects the extent to which the natural environment has a role in a person's self-definition. We measured this construct using the Environmental Identity scale (Clayton, 2003). This scale has 24 items (e.g., "I think of myself as part of nature, not separate from it"), scored from 1 (*never true*) to 7 (*almost always true*). For analysis, we calculated and used a composite mean score representing total environmental identity, which is supported by research (Moreira, Loureiro, Inman, & Olivos-Jara, 2021).

2.2.4. Nature Relatedness Scale (samples 1 and 3)

Nature relatedness captures the level of connectedness individuals feel with the natural world. We assessed this construct in participants using the brief Nature Relatedness Scale (NR-6; Nisbet & Zelenski, 2013). (e.g., "I take notice of wildlife wherever I am"). Items are scored from 1 (*strongly disagree*) to 5 (*strongly agree)*.

2.2.5. Environmental-Schwartz Value Scale (sample 2 only)

Environmental beliefs and behaviors are influenced by personal values; particularly self-transcendence values. We measured participants' self-transcendence values using the Environmental-Schwartz Value Scale (Bouman, Steg, & Kiers, 2018; Steg, Perlaviciute, van der Werff, & Lurvink, 2014; Stern, Dietz, & Guagnano, 1998). The E-SVS measures four types of values relevant to environmental beliefs and behaviors, including two types of self-transcendence values: biospheric (concern for the environment; four items) and altruistic (concern for the welfare of other people; five items). We did not consider the two self-enhancement values also measured by the E-SVS. E-SVS items, presented in the form of a value (e.g., "UNITY WITH NATURE"), are scored on a 9-point scale from −1 (*opposed to my values*), to 0 (*not important*) to 7 (*of supreme importance*).

2.2.6. Pro-sustainability behaviors (samples 1 and 3)

Frequency of pro-sustainability behavior was assessed using 12 items designed specifically for The Portuguese Longitudinal Study of Student Engagement with Sustainable Development (Moreira, 2017) (see Appendix). These items reflect behaviors linked to the sustainable use and consumption of products (e.g., saving leftover food or using products until the end), ethical product choices (e.g., choosing environmentally friendly brands or clothes not made of animal skin), and localism (e.g., choosing to buy local products). Participants indicate the frequency they had performed each behavior in the last month on a five-point scale from 1 (*never*) to 5 (*always*). Two items required reverse coding so that higher scores reflect a higher frequency of pro-sustainability behavior. For analysis, we calculated a total score reflecting overall levels of pro-sustainable behaviors.

2.3. Statistical analyses

All analyses were conducted using R (version 3.6.3; R Core Team, 2019).

2.3.1. Structural validity (samples 1, 2 and 3)

To assess the factor structure of the EDiSDI we tested the bifactor model championed in Moreira et al. (2020) using confirmatory factor analysis (CFA) (Fig. 1). Considering the basic rule-of-thumb of a sample size-to-variable ratio >10 our samples were adequate for testing the bifactor model. All CFAs used an MLR estimator. Model fit was assessed using the goodness-of-fit indices and thresholds suggested by Hu and Bentler (1999; CFI ≥0.95, RMSEA <0.06, and SRMR <0.08). We assessed scale reliabilities by calculating omega coefficients (ω) and unidimensionality of the general factors by calculating omega hierarchical (ω$_H$).

2.3.2. Convergent validity (samples 1, 2 and 3)

An instrument has the property of validity if it measures what it purports to measure (Borsboom, Mellenbergh, & Van Heerden, 2004). This can be established indirectly by demonstrating that scores from the measure correlate in an expected manner with theoretically related constructs. We estimated the degree of association between EDiSDI dimensions and several theoretically-related constructs, including environmental identity (Clayton, 2003), nature relatedness (Nisbet et al., 2009) and environmental action (Alisat & Riemer, 2015). Prior work has shown these constructs are positively correlated with engagement with sustainable development and negatively correlated with disengagement with sustainable development (Moreira et al., 2020). We also explored correlations between EDiSDI scores and self-transcendence values.

2.3.3. Predictive validity (samples 1 and 3)

We tested whether adolescents' total engagement and disengagement scores predicted[2] self-reported pro-sustainability behaviors using hierarchical linear regression. *A priori* calculations using G*Power indicated our samples were sufficiently large to detect medium effects ($f^2 = 0.15$) in linear multiple regression with the required number of predictors. At Step 1, we included participant age and gender as control variables. At Step 2, we included disengagement with sustainable development. At Step 3, we included engagement with sustainable development. Disengagement and engagement were entered in separate steps to evaluate the independent contributions of each scale. We chose not to include the behavioral, cognitive, and emotional dimensions of engagement and disengagement individually because we expected strong multicollinearity.

2.3.4. Measurement invariance (samples 1, 2 and 4)

We used MGCFA (Bollen, 1989) to test the psychometric equivalence (invariance) of the EDiSDI across age, society, and gender. Because measurement invariance analysis can be biased when group sizes are unbalanced (Yoon & Lai, 2018) we used (a) a random subsample of Sample 1 of equal size to Sample 4 when testing measurement invariance across age, and (b) a random subsample of Sample 4 of equal size to Sample 2 when testing measurement invariance across society. We tested whether the EDiSDI had measurement invariance across gender using male and female adolescents (Sample 1). For all analyses, we tested the bifactor structure supported by Moreira et al. (2020). In MGCFA, testing nested models with increasing numbers of parameter restrictions allows for an assessment of configural, metric, and scalar invariance. Configural invariance tests the extent to which the model fits across the global sample. Metric invariance (with loadings constrained across groups) tests the extent to which items load on the factors similarly across groups. Finally, scalar invariance (with loadings and intercepts constrained across groups) tests whether sample means can be meaningfully compared across groups. We tested measurement invariance by assessing ΔX^2 between groups. Significant differences at $p < .05$ were considered evidence of noninvariance; that is, the EDiSDI does not have the same psychometric properties across groups. We also examined changes in various alternative fit indices because these are typically less sensitive to sample size (Putnick & Bornstein, 2016). A change in CFI ≥ −0.010 paired with change in RMSEA ≥0.015 and SRMR ≥0.030 for metric invariance or ≥ 0.015 for scalar invariance indicated non-invariance (Chen, 2007).

2.3.5. Engagement as a general factor? (Sample 1)

In **Section** 1.1 we argued that various constructs that capture the way humans relate to sustainable development issues (e.g., environmental identity, nature relatedness etc.) share in common the same basic underlying psychological processes and mechanisms. Theoretically, these commonalities are captured by the construct of engagement. To explore this hypothesis, we tested a bifactor model in which a single general factor, representing engagement, accounted for relationships between items measuring pro-sustainability thoughts, pro-sustainability feelings, pro-sustainability behaviors (EDiSDI), nature relatedness (NR-6), and environmental identity (the EID scale). Specific factors in this model accounted for unique variance among the distinct scales. If these distinct measures are markers of a common construct, then the general factor should be the dominant source of variance in the bifactor model. This was determined be examining bifactor indices, specifically ω$_H$ and ECV.

---

[2] Because our data were cross-sectional, we use the word 'predict' to refer to estimation of new data, not in a prospective manner that infers causality.

3. Results

3.1. Structural validity

3.1.1. Portuguese adolescents (sample 1)

The bifactor model had good fit to the data: CFI = 0.957, RMSEA = 0.037, 90% CI [0.035, 0.038], SRMR = 0.055. Standardized factor loadings on the two general factors were mostly high (0.27 - 0.75), and all were statistically significant (see Supplementary Materials for all loadings). The latent factor correlation between the engagement and disengagement general factor was −0.52. Omega (ω) values for the engagement (ω = 0.92) and disengagement (ω = 0.92) general factors indicated excellent internal consistency reliability (see Table 2). Omega hierarchical (ω$_H$) coefficients were high for both the engagement and disengagement general factors (ω$_H$ = 0.80 and 0.85, respectively). ω$_H$ values for the specific factors were low (<0.42).

3.1.2. British adults (sample 2)

Fit indices for the bifactor model were acceptable but not excellent: CFI = 0.871, RMSEA = 0.062, 90% CI [0.056, 0.069], SRMR = 0.072. All but one of the factor loadings on the two general factors were significant (see Supplementary Materials for all loadings). Item 3 did not load significantly on the disengagement general factor. The lower fit for this model appeared to be due to nonsignificant loadings on specific factors, particularly the emotional engagement specific factor, which was suggestive of over-factoring. The latent factor correlation between the engagement and disengagement general factor was −0.89. ω was 0.90 for the engagement general factor and 0.88 for the disengagement general factor (see Table 2). In turn, ω$_H$ coefficients were high for both the engagement and disengagement general factors (ω$_H$ = 0.81 and 0.72, respectively). ω$_H$ values for the specific factors were low (<0.36).

3.1.3. Portuguese adults (sample 3)

This complete bifactor model did not converge to an admissible solution for Sample 3. An examination of error variances suggested this was due to over-factoring of the emotional engagement specific factor. We consequently tested an incomplete bifactor model omitting this factor from the model. This model had reasonable fit: CFI = 0.907, RMSEA = 0.051, 90% CI [0.044, 0.057], SRMR = 0.069. The lower values for CFI appeared to be due to nonsignificant loadings on the cognitive and emotional disengagement specific factors (see Supplementary Materials for all loadings). The latent factor correlation between the engagement and disengagement general factor was −0.72. ω was 0.91 for the engagement general factor and 0.90 for the disengagement general factor (see Table 2). ω$_H$ coefficients were high for both the engagement and disengagement general factors (ω$_H$ = 0.73 and 0.74, respectively). ω$_H$ values for the specific factors were low (<0.46).

Table 2
Omega and omega hierarchical coefficients for the bifactor models tested in Samples 1 to 3.

	PT adolescents (Sample 1)		UK adults (Sample 2)		PT adults (Sample 3)	
	ω	ω$_H$	ω	ω$_H$	ω	ω$_H$
General Factors						
Engagement	.92	.80	.90	.81	.91	.73
Disengagement	.92	.85	.88	.72	.90	.74
Specific Factors						
Pro-sustainability thoughts	.80	.22	.74	.36	.86	.45
Pro-sustainability feelings	.80	.18	.68	.01	–	–
Pro-sustainability actions	.87	.32	.88	.22	.90	.46
Sustainability-hindering thoughts	.86	.00	.73	.33	.81	.23
Sustainability-hindering feelings	.83	.31	.80	.28	.82	.39
Sustainability-hindering actions	.77	.42	.82	.25	.83	.40

Note. Pro-sustainability feelings specific factor not included in model for Sample 3. PT = sample from Portugal. UK = sample from UK.

3.2. Convergent validity

Pearson's correlations between EDiSDI dimensions and theoretically related constructs are shown in Table 3. Across samples, total engagement showed a pattern of positive correlations with environmental action, environmental identity, nature relatedness, and biospheric and altruistic values. Expectedly, these constructs also showed a pattern of negative correlations with total disengagement.

Theoretically, the emotional, cognitive, and behavioral components of engagement and disengagement are distinct, yet interrelated, constructs. Consistent with this assertion, we found that all engagement dimensions had positive correlations with the theoretically related constructs, while all disengagement dimensions had negative correlations. However, some differences in the magnitudes across dimensions were suggestive of conceptual divergence. For example, cognitive engagement (*M* correlation = 0.13) was more weakly associated with environmental action in adults than behavioral engagement (*M* correlation = 0.38). Cognitive disengagement was also more weakly associated with nature relatedness (*M* correlation = −0.14) than behavioral disengagement (*M* correlation = −0.28).

3.3. Predictive validity

Output of the hierarchical linear regressions, including standardized beta coefficients, are shown in Table 4.

3.3.1. Portuguese adolescents (sample 1)

The hierarchical regression at Step 1 showed that Age and Gender contributed significantly to the model, but accounted for less than 0.4% of the variance in pro-sustainability behavior, $F(2, 3146) = 7.91$, $p < .001$. The addition of Total Disengagement at Step 2 resulted in the model explaining 0.5% of the variance. This small increase in R^2 was not statistically significant, $F(1, 3145) = 3.55$, $p = .060$. In Step 3, the addition of Total Engagement resulted in the model explaining 14.1% of the variance in pro-sustainability behavior, with this increase being significant, $F(1, 3144) = 497.57$, $p < .001$. The strongest contributor to this final model, with a medium effect, was Total Engagement ($\beta = 0.41$, $p < .001$, $f^2 = 0.16$). Total Disengagement also contributed to the final model, although the f^2 value implied it could not be considered a "practically" significant effect ($\beta = 0.13$, $p < .001$, $f^2 = 0.00$).

3.3.2. Portuguese adults (sample 3)

The hierarchical regression at Step 1 showed that Age and Gender contributed significantly to the model, and accounted for 4.5% of the variance in pro-sustainability behavior, $F(2, 313) = 8.49$, $p < .001$. Adding Total Disengagement in Step 2 resulted in the model explaining 15.3% of the variance, with this change in R^2 being significant, $F(1, 312) = 42.97$, $p < .001$. In Step 3, adding Total Engagement resulted in the model explaining 19.4% of the variance in pro-sustainability behavior, with this change in R^2 being significant, $F(1, 311) = 16.88$, $p < .001$. The strongest contributor to this final model was Total Engagement ($\beta = 0.25$, $p < .001$, $f^2 = 0.05$) followed by Total Disengagement ($\beta = -0.20$, $p = .001$, $f^2 = 0.14$).

3.4. Measurement invariance

The outputs of the three MGCFAs are presented in Table 5. These include alternative fit indices and their change between consecutive models.

3.4.1. Portuguese adolescents vs. Portuguese adults

Overall, the changes observed for CFI, RMSEA, and SRMR across models supported scalar invariance between adolescents (Sample 1) and adults from Portugal (Sample 4). It was noteworthy that while the measures were psychometrically invariant, the latent correlation between the engagement and disengagement factors differed somewhat,

Table 3
Pearson's correlations (and 95% confidence intervals) testing convergent validity of the EDiSDI.

	Environmental Action Scale		Environmental Identity Scale		Nature-Relatedness Scale		Environmental – Schwartz Value Scale	
	Environmental Action		Environmental Identity		Nature Relatedness		Biospheric Values	Altruistic Values
Sample	UK Adults (Sample 2)	PT Adults (Sample 3)	PT Adolescents (Sample 1)	PT Adults (Sample 3)	PT Adolescents (Sample 1)	PT Adults (Sample 3)	UK Adults (Sample 2)	UK Adults (Sample 2)
Engagement	.46 [.30, .60]	.24 [.09, .39]	.50 [.46, .54]	.50 [.35, .62]	.45 [.40, .49]	.46 [.31, .59]	.63 [.50, .73]	.44 [.28, .58]
Cognitive	.26 [.08, .42]	.00† [-.11, .11]	.37 [.32, .42]	.31 [.15, .45]	.29 [.24, .33]	.24 [.09, .38]	.36 [.19, .51]	.36 [.19, .51]
Emotional	.39 [.22, .54]	.20 [.05, .33]	.46 [.41, .50]	.48 [.33, .61]	.42 [.37, .47]	.47 [.32, .60]	.59 [.45, .71]	.39 [.22, .54]
Behavioral	.47 [.31, .60]	.29 [.14, .43]	.44 [.40, .49]	.40 [.24, .53]	.42 [.37, .46]	.37 [.21, .50]	.58 [.44, .70]	.36 [.19, .52]
Disengagement	-.26 [-.42, -.09]	-.09 [-.23, .05]	-.26 [-.31, -.22]	-.37 [-.51, -.22]	-.17 [-.21, -.13]	-.32 [-.46, -.17]	-.49 [-.62, -.33]	-.38 [-.53, -.21]
Cognitive	-.10† [-.27, .07]	-.01† [-.14, .11]	-.20 [-.25, -.16]	-.21 [-.35, -.06]	-.10 [-.14, -.07]	-.18 [-.32, -.03]	-.31 [-.46, -.14]	-.32 [-.47, -.14]
Emotional	-.25 [-.41, -.08]	-.06† [-.19, .07]	-.27 [-.32, -.23]	-.40 [-.53, -.24]	-.19 [-.23, -.14]	-.31 [-.44, -.15]	-.41 [-.55, -.24]	-.35 [-.50, -.18]
Behavioral	-.35 [-.50, -.18]	-.17 [-.31, -.03]	-.23 [-.27, -.18]	-.40 [-.54, -.25]	-.20 [-.24, -.15]	-.36 [-.50, -.21]	-.52 [-.65, -.36]	-.27 [-.43, -.10]

Note. All correlations are statistically significant at *p* < .05 apart from those indicated by †. PT = Portuguese sample. UK = UK sample.

Table 4
Summary of hierarchical linear regression analyses.

	PT adolescents (Sample 1; *n* = 3259)					PT adults (Sample 3; *n* = 324)				
	Model Statistics					Model Statistics				
	adj R^2	F	β	p	f^2	adj R^2	F	β	p	f^2
DV: Pro-sustainability behavior										
Step 1	.00	7.91		<.001		.05	8.49		<.001	
Age			-.06	.001	.004			.13	.024	.010
Gender (Female = 1)			.04	.046	.001			.19	<.001	**.042**
Step 2	.01	6.30		<.001		.15	20.01		<.001	
Age			-.05	.003	.004			.14	.008	**.020**
Gender			.03	.150	.001			.12	.030	**.042**
Disengagement			-.03	.080	.001			-.34	<.001	**.136**
Step 3	.14	129.9		<.001		.19	19.99		<.001	
Age			-.04	.031	.004			.12	.020	**.020**
Gender			-.02	.178	.001			.12	.017	**.053**
Disengagement			.13	<.001	.001			-.20	.001	**.136**
Engagement			.41	<.001	**.163**			.25	<.001	**.053**

Note. PT = Sample from Portugal. UK = Sample from UK. F² values in bold are those representing a small effect or larger (*f²* ≥ 0.02; Cohen, 1988).

Table 5
Fit indices for configural, metric, and scalar models testing measurement invariance of the EDiSDI bifactor structure.

	X²	df	Model comp	CFI	ΔCFI	RMSEA	ΔRMSEA	SRMR	ΔSRMR	Decision
Age										
Portuguese Adolescents (random subsample of Sample 1; *n* = 799) vs. Portuguese Adults (Sample 4; *n* = 799)										
M1. Configural	1341.06	592	–	.965	–	.040	–	.046	–	ACCEPT
M2. Metric	1486.91	638	M1	.960	-.005	.041	.001	.056	.010	ACCEPT
M3. Scalar	1666.30	657	M2	.953	-.007	.044	.003	.059	.003	ACCEPT
Society										
British Adults (Sample 2; *n* = 300) vs. Portuguese Adults (random subsample of Sample 4; *n* = 300)										
M1. Configural	1074.66	544	–	.934	–	.057	–	.057	–	ACCEPT
M2. Metric	1197.92	588	M1	.924	-.010	.059	.002	.078	.021	ACCEPT
M3. Scalar	1352.52	606	M2	.907	-.017	.064	.005	.080	.002	REJECT
M3a. Partial Scalar[a]	1302.87	605	M2	.913	-.011	.062	.003	.080	.002	REJECT
M3b. Partial Scalar[b]	1293.15	604	M2	.914	-.010	.062	.003	.080	.002	ACCEPT
Gender										
Male adolescents (subsample of Sample 1; *n* = 1529) vs. Female adolescents (subsample of Sample 1; *n* = 1620)										
M1. Configural	2193.77	608	–	.943	–	.041	–	.056	–	ACCEPT
M2. Metric	1955.30	638	M1	.953	.010	.036	-.005	.057	.001	ACCEPT
M3. Scalar	1994.91	657	M2	.952	-.001	.036	.000	.057	.000	ACCEPT

Note.
[a] Free intercept for item 21.
[b] Free intercepts for items 21 and 10.

with a value of −0.89 for the adult sample and −0.53 for the adolescents.

3.4.2. Portuguese adults vs. British adults

Based on the results presented in **Section 3.1**, the first model tested was the configural bifactor model omitting Item 3 (Model M1). This

model had acceptable fit, and we thus proceeded to test for metric and scalar invariance. The latent factor correlation between engagement and disengagement general factors for the Portuguese version was −0.88, while for the English version this value was −0.89. Metric invariance was supported according to the adopted change criterion (Model M2). The decrease in CFI when testing Model M3 was > −0.01, suggesting scalar noninvariance. Consequently, we investigated the source of noninvariance by examining modification indices for model intercepts and then sequentially releasing item intercept constraints (Models M3a and M3b). A partially invariant model was achieved when releasing intercept constraints for items 21 and 10. Releasing some intercepts or loadings is common and does not impact the conclusion of measurement invariance as long as less than half of the intercepts of loadings are still constrained (Byrne, Shavelson, & Muthén, 1989; Vandenberg & Lance, 2000).

3.4.3. Portuguese boys vs. Portuguese girls

A configural model for the full bifactor model did not converge to an admissible solution and it was evident from the error variance values that this was related to the over-factoring of the sustainability-hindering thoughts specific factor. Consequently, the configural model presented in Table 4 was an incomplete bifactor model without this specific factor. For this model, the changes observed for CFI, RMSEA, and SRMR across models supported scalar invariance between boys and girls.

3.5. Engagement as a general factor?

The correlations presented in **Section 3.2** showed engagement had moderate to strong correlations with a range of constructs that capture

the way humans relate to sustainable development issues. This suggested that there was a commonality among all these constructs. Consequently, we tested the extent to which engagement with sustainable development, nature relatedness, and environmental identity represent a single latent construct. The output of the tested bifactor model and the associated bifactor indices are shown in Table 6.

The bifactor indices were generally supportive of our hypothesis. ω_H for the general factor was high (0.77), suggesting that nearly 80% of the variance in total scores across these items was attributable to the general engagement factor. The difference between omega and ω_H was 0.18, implying the general factor was largely determinant of the systematic variance associated with composite scores. If ω was high and ω_H much lower, this would be evidence that multidimensionality would prevent item scores being interpreted as indicators of a single construct. ECV values indicate that more than 50% of the common variance is explained by the general factor, indicating that despite sizeable multidimensionality, the general factor was the dominant source of variance.

4. General discussion

The overarching purpose of this article was to expand evidence on the suitability and adequacy of the EDiSDI for assessing engagement and disengagement with sustainable development. Overall, our findings suggest that the proposed framework is valid and informative for describing the common psychological processes within individuals that link them to sustainable development and promote desirable sustainable development outcomes.

A first major finding was that the bifactor structure championed by Moreira et al. (2020) had good fit to data from a large sample of

Table 6

Completely standardized coefficients, error variance, and bifactor indices for bifactor model testing the general factor hypothesis (Sample 1, PT adolescents; n = 3259).

Scale	Item	General Factor	Specific Factors					Error Variance
			NR	EID	EMO	BEH	COG	
EDiSDI	I-22	.71			.39			.34
EDiSDI	I-23	.47			.22			.73
EDiSDI	I-24	.64			.35			.48
EDiSDI	I-25	.65			.33			.47
EDiSDI	I-9	.64				.39		.44
EDiSDI	I-10	.63				.51		.34
EDiSDI	I-11	.64				.52		.33
EDiSDI	I-12	.65				.41		.42
EDiSDI	I-13	.60				.26		.57
EDiSDI	I-19	.50					.61	.38
EDiSDI	I-20	.56					.57	.36
EDiSDI	I-21	.65					.25	.52
NR-6	I-1	.18	.40					.81
NR-6	I-2	.56	.33					.58
NR-6	I-3	.51	.61					.36
NR-6	I-4	.45	.56					.49
NR-6	I-5	.50	.65					.33
NR-6	I-6	.43	.61					.45
EID Scale	I-1	.35		.43				.69
EID Scale	I-2	.51		.51				.48
EID Scale	I-3	.51		.46				.53
EID Scale	I-4	.42		.58				.48
EID Scale	I-5	.37		.49				.62
EID Scale	I-6	.52		.51				.47
EID Scale	I-7	.51		.52				.47
EID Scale	I-8	.37		.51				.61
EID Scale	I-9	.49		.63				.36
EID Scale	I-10	.48		.57				.45
EID Scale	I-11	.51		.60				.38
	ECV	.54	.12	.21	.03	.06	.05	
	Omega	.95	.85	.92	.79	.87	.80	
	Omega$_H$	.77	.50	.52	.17	.27	.33	
	PUC	.78						

Note. NR = Nature relatedness. EID = Environmental Identity. EMO = Emotional Engagement. COG = Cognitive Engagement. BEH = Behavioral Engagement. Model Fit: CFI = 0.905, RMSEA = 0.056, SRMR = 0.078.

adolescents from Portugal. This bifactor model comprised two general factors (reflecting engagement and disengagement with sustainable development), each with three specific factors (reflecting emotional, cognitive, and behavioral dimensions). Consistent with what was found with adults from Portugal (Moreira et al., 2020), and with other engagement instruments applied to other contexts (Inman, Moreira, Cunha, & Castro, 2020; Moreira, Cunha, & Inman, 2020b), the pattern of factor loadings combined with bifactor fit indices suggested that composite engagement and disengagement scores can be interpreted as measures of essentially unidimensional constructs.

When testing the EDiSDI bifactor model in independent adult samples from Portugal and the UK, some divergences were noted. For adults in the UK, a non-significant loading for Item 3 "The future of the planet is entirely in the hands of people in positions of leadership" on the general factor was a clear example of why measurement invariance analysis across translations of the same measure is required. Although the literal translation of the item was good, it was clear that for English speakers the interpretation of the item was different from Portuguese speakers. One possibility is that for English speakers this item may have been interpreted as an objective rating about the role of leaders (more like the question "Do leaders have the strongest influence on sustainable development?). In contrast, for Portuguese-speakers this item may have been interpreted more as a measure of subjective sense of agency (more like the question "Do you feel like you have the ability to shape the future of the planet?").

Another observation was that for the adult samples from Portugal and the UK some of the specific factors were not well represented in the data, resulting in less optimal model fit. For example, in adults from the UK the sustainability-hindering feelings specific factor accounted for just 1% of the variance in scores associated with that specific factor. For the adult sample from Portugal, the model would not converge unless this specific factor was removed from the model. Nonetheless, in all cases, the general conclusion, supported by bifactor indices, was that engagement and disengagement with sustainable development are unidimensional, yet broad and complex, constructs.

Consistent with the first psychometric investigation of the EDiSDI (Moreira et al., 2020), we found that engagement had a pattern of positive correlations with nature relatedness, environmental identity, and civic environmental action. Also consistent with this initial study, we found that disengagement was negatively correlated with these variables. Because these results are (a) consistent with our proposed engagement framework, (b) consistent with past research findings, and (c) demonstrated in distinct samples including adults, adolescents, and in different societal groups, they serve as a robust demonstration that the EDiSDI has construct validity.

This study also expands on current knowledge of the nomological network surrounding the EDiSDI by showing moderate to strong positive correlations between engagement and self-transcendence values. Although all people endorse all values to some degree (Rokeach, 1973), these results suggest those who give more value the environment and the welfare of others – in other words, the core tenants of sustainable development – tend to have higher scores for engagement with sustainable development and lower scores for disengagement. This observation is consistent with a robust body of work that shows personal values are key determinants of environmental beliefs and behaviors (Bouman et al., 2018; Steg et al., 2014; Stern et al., 1998) and represents further evidence of convergent validity.

A new contribution to current evidence was the demonstration that EDiSDI scores were predictive of variance in measures of pro-sustainability behaviors; both in adolescents and adults. Participants with higher engagement reported doing more pro-sustainability behaviors in the last month (e.g., choosing environmentally friendly brands, and minimizing waste) and were also more likely to be acting to address environmental issues (e.g., protecting wildlife). This finding is significant because it aligns with the key theoretical proposition that engagement is an enabler of positive outcomes, thus validating the

framework in the context of sustainable development.

An interesting related finding was that disengagement with sustainable development did not appear to be meaningfully associated with pro-sustainability behaviors for adolescents when included in the regression model alongside engagement (although displayed weak negative associations when included in the model without engagement). In contrast, for the adults, disengagement had a significant negative association with pro-sustainability behaviors alone and when included alongside engagement. In other words, the disengagement scale appeared to be mostly redundant for young adolescents yet had incremental validity in adults. One possibility is that disengagement with sustainable development can be expressed in a more salient way in adults, with a stronger influence on overt behaviors, because adult behavioral systems are more differentiated and complex than in adolescents. Moreover, adults have more freedom than adolescents to make decisions that can shape their environments, meaning disengagement in adults is more likely to influence overt behaviors. In contrast, adolescents have more constraints over their behaviors because their primary contexts (home and school) are controlled by teachers and parents. Thus, disengaged adolescents may still have to engage in pro-sustainable behaviors because it is a component of their context. Future studies should examine the construct of disengagement in detail as this may have significant implications for engagement theory and the way interventions for promoting sustainable development are implemented in different groups of people.

As described above, the CFAs suggested the EDiSDI has a similar bifactor structure in multiple samples, including those comprising either adults or adolescents, and adults from different societies (although the fit was acceptable but not excellent for the UK sample). However, from these results it is incorrect to conclude that the EDiSDI has psychometric equivalence across groups – that is, that the items and constructs mean the same thing – without testing for measurement invariance. To address this issue, we conducted a series of MGCFAs. These analyses showed that the EDiSDI had scalar invariance across age, society, and gender, implying that the same phenomenon is being captured across these samples. The implication of this finding is that comparisons of EDiSDI scores across distinct age groups, and across societies, are meaningful. With this type of detailed understanding, researchers can use the EDiSDI to measure and compare engagement with sustainable development in different types of people, with the resulting information being useful for targeting interventions and educational programs to the specific challenges faced by distinct populations.

4.1. Engagement as a commonality in different approaches to Sustainable Development

In the article introduction, we argued that various existing constructs and frameworks for understanding the way people relate to sustainable development issues (e.g., environmental identity; Clayton, 2003) share in common the same underlying psychological processes that are captured by the construct of engagement with sustainable development. Our analyses offer some support for this hypothesis. First, it was evident that engagement had moderate to strong positive correlations with several constructs that capture the way humans relate to sustainable development issues. The size and consistency of these associations were suggestive that people's subjective sense of identification and connection with sustainable development (i.e., engagement) may underlie all these constructs; certainly, at least, they indicated that there was a strong communality.

Stronger evidence for our hypothesis was obtained by testing a bifactor model. Bifactor indices obtained from this model suggested that a single general factor accounted for the majority (77%) of variance in items designed to measure various distinct constructs. From this value, it would be possible to interpret a total score across these items as a measure of a single construct. Bifactor indices also indicated that more than 50% of the common variance was explained by the general factor,

implying it was the dominant factor being measured by this set of items despite multidimensionality. While the values for ω_H and ECV fell short of the thresholds for unidimensionality (e.g., ω_H values > 0.80; Reise, Scheines, Widaman, & Haviland, 2013; the combination of PUC <.80, ECV >0.60 and ω_H > 0.70; Reise, Scheines, et al., 2013), the closeness to surpassing them was noteworthy given that the sets of items from the different scales will have had sizeable common variance due to method factors such as distinct scoring methods, wording, and location within the questionnaire battery. Hence, we tentatively concluded that a single general factor reflecting engagement accounts for relationships among pro-sustainability thoughts, pro-sustainability emotions, pro-sustainability behaviors, nature relatedness, and environmental identity.

4.2. Limitations

First, it is necessary to acknowledge the study methodology was limited by the sole use of self-report measures, which implies that participants' responses may have been subject to bias and cognitive distortion. Indeed, in the case of sustainable development participants may be particularly motivated to present themselves favorably rather than truthfully.

Second, there were limitations associated with the samples considered in this study. It is important to recognize that one of the adult samples was representative of a specific subpopulation of adults (i.e., secondary school teachers). As such, we caution against generalizing findings from this sample to the general adult population. Other characteristics, such as the large percentage of women in the UK adult sample, are further examples of how the study samples may not be truly representative of the general population. This limitation is linked to our use of non-probabilistic sampling strategies to recruit participants. However, it is worth noting that the large sample of adolescents (>3000) is a strength of the study.

A third limitation of the study relates to the operationalization of the EDiSDI. Theoretically, engagement reflects the common underlying psychobiological processes that underpin the way humans relate to all sustainable development issues. However, while some EDiSDI items address sustainable development as a broad concept (e.g., "Global sustainability issues are boring") most have an environmental focus (e.g., "I strive to do things that protect the planet and environment"). In turn, no items specifically address social or economic aspects of sustainable development. An implication of this design feature is that the EDiSDI may not be an appropriate tool for evaluating how people relate to social and economic sustainability issues. Future development and refinement of the EDiSDI will be required to address this issue. One possibility is to revise existing items so that they only refer to sustainable development as a broad construct. A second option, aligning with the approach of other instruments (e.g., Gericke et al., 2019) is to develop new items that refer explicitly to social and economic sustainable development. As a related issue, research has demonstrated for some time that attitudes toward general constructs (such as sustainable development as a holistic topic) are poor predictors of specific behaviors (the *Attitude-Behavior Gap*; Gutfeld, 1991). That said, Epstein (1979) demonstrated that broad predictor variables can predict broad outcome criteria with good precision, which may be more relevant in the context of sustainable development when a more appropriate target for behavioral prediction is not what a person does in specific instances, but how they behave overall.

5. Conclusions

A major contribution of this study is that it supports an integrative framework for conceptualizing two major expressions of how people relate to sustainable development issues: engagement and disengagement. The study demonstrates that the EDiSDI, a measure of engagement and disengagement with sustainable development, has strong potential

as a valid tool for research across diverse samples, including cross-cultural samples. Although future studies will be necessary to develop and test other versions and translations of the EDiSDI, our findings imply that this measure can be used to compare peoples' engagement and disengagement with sustainable development in different contexts and circumstances, including in response to policies, interventions, or education strategies for promoting sustainable development across countries. This will be particularly relevant for understanding and then addressing negationist and reactive behavioral responses to sustainable development issues.

Appendix 1

Items used for the measure of pro-sustainability behaviors (English translations).

Next are a series of questions about your behaviors in the **last month**. Respond to option that best describes the frequency you performed each behavior.

1 = Never; 2 = Rarely; 3 = Sometimes; 4 = Often; 5 = Always
1. Did you choose to eat food imported from/produced in other countries?
2. Did you save leftover food and eat it at the next meal?
3. Did you choose to eat seasonal fruit and vegetables?
4. Did you avoid buying clothes or objects made of animal skin?
5. Did you give away clothes you do not use?
6. Did you choose to buy clothes made without toxic products?
7. Did you choose to buy hygiene/beauty products from other countries?
8. Did you avoid wasting hygiene/beauty products (e.g., using the products until the end)?
9. Did you give away electronic products that you no longer use?
10. Did you choose electronic products from brands that respect the rights of their workers?
11. Did you choose a brand known to be environmentally friendly?
12. Did you buy or use second-hand clothes?

References

Afrahi, B., Blenkinsopp, J., Fernandez de Arroyabe, J. C., & Karim, M. S. (2021). Work disengagement: A review of the literature. *Human Resource Management Review*. advance online publication https://doi.org/10.1016/j.hrmr.2021.100822.

Alisat, S., & Riemer, M. (2015). The environmental action scale: Development and psychometric evaluation. *Journal of Environmental Psychology, 43*, 13–23. https://doi.org/10.1016/j.jenvp.2015.05.006

Appleton, J. J., Christenson, S. L., Kim, D., & Reschly, A. L. (2006). Measuring cognitive and psychological engagement: Validation of the student engagement instrument. *Journal of School Psychology, 44*(5), 427–445. https://doi.org/10.1016/j.jsp.2006.04.002

Atkinson, G., Dietz, S., & Neumayer, E. (2007). Introduction. In G. Atkinson, S. Dietz, & E. Neumayer (Eds.), *Handbook of sustainable development* (pp. 1–23). Edward Elgar Publishing.

Biasutti, M., & Frate, S. (2017). A validity and reliability study of the Attitudes toward Sustainable Development scale. *Environmental Education Research, 23*(2), 214–230. https://doi.org/10.1080/13504622.2016.1146660

Bobek, D., Zaff, J., Li, Y., & Lerner, R. M. (2009). Cognitive, emotional, and behavioral components of civic action: Towards an integrated measure of civic engagement. *Journal of Applied Developmental Psychology, 30*(5), 615–627. https://doi.org/10.1016/j.appdev.2009.07.005

Bollen, K. A. (1989). *Structural equations with latent variables.* Wiley.

Borsboom, D., Mellenbergh, G. J., & Van Heerden, J. (2004). The concept of validity. *Psychological Review, 111*(4), 1061–1074. https://doi.org/10.1037/0033-295X.111.4.1061

Bouman, T., Steg, L., & Kiers, H. A. L. (2018). Measuring values in environmental research: A test of an environmental portrait value questionnaire. *Frontiers in Psychology, 9*, 564. https://doi.org/10.3389/fpsyg.2018.00564

Brandstätter, V., & Bernecker, K. (2022). Persistence and disengagement in personal goal pursuit. *Annual Review of Psychology, 73*(3), 1–3, 29.

Brown, K. W., & Kasser, T. (2005). Are psychological and ecological well-being compatible? The role of values, mindfulness, and lifestyle. *Social Indicators Research, 74*(2), 349–368. https://doi.org/10.1007/s11205-004-8207-8

Byrne, B. M., Shavelson, R. J., & Muthén, B. O. (1989). Testing for the equivalence of factor covariance and mean structures: The issue of partial measurement invariance. *Psychological Bulletin, 105*(3), 456–466. https://doi.org/10.1037/0033-2909.105.3.456

Carroll, J. B. (1993). *Human cognitive abilities.* Cambridge University Press.

Caspi, A., Houts, R. M., Belsky, D. W., Goldman-Mellor, S. J., Harrington, H., Israel, S., et al. (2014). The p factor: One general psychopathology factor in the structure of psychiatric disorders? *Clinical Psychological Science, 2*(2), 119–137. https://doi.org/10.1177/2167702613497473

Chen, F. F. (2007). Sensitivity of goodness of fit indexes to lack of measurement invariance. *Structural Equation Modeling, 14*(3), 464–504. https://doi.org/10.1080/10705510701301834

Christian, M. S., Garza, A. S., & Slaughter, J. E. (2011). Work engagement: A quantitative review and test of its relations with task and contextual performance. *Personnel Psychology, 64*, 89–136.

Clayton, S. (2003). Environmental identity: A conceptual and an operational definition. In S. Clayton, & S. Opotow (Eds.), *Identity and the natural environment: The psychological significance of nature* (pp. 45–66). The MIT Press.

Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd ed.). Erlbaum.

Connell, J. P., & Wellborn, J. G. (1991). Competence, autonomy and relatedness: A motivational analysis of self-system processes. In M. R. Gunnar, & L. A. Sroufe (Eds.), *Minnesota symposium on child psychology* (pp. 43–77). Erlbaum.

Epstein, S. (1979). The stability of behavior: I. On predicting most of the people much of the time. *Journal of Personality and Social Psychology, 37*(7), 1097–1126. https://doi.org/10.1037/0022-3514.37.7.1097

Fall, A.-M., & Roberts, G. (2012). High school dropouts: Interactions between social context, self-perceptions, school engagement, and student dropout. *Journal of Adolescence, 35*(4), 787–798. https://doi.org/10.1016/j.adolescence.2011.11.004

Fredricks, J. A., & Paris, A. H. (2004). School engagement: Potential of the concept , state of the evidence. *Review of Educational Research, 74*(1), 59–109.

Gardner, G. T., & Stern, P. C. (1996). *Environmental problems and human behavior.* Allyn & Bacon.

Gardner, G. T., & Stern, P. C. (2008). The Short List: The most effective actions U.S. households can take to curb climate change. *Environment: Science and Policy for Sustainable Development, 50*(5), 12–25. https://doi.org/10.3200/ENVT.50.5.12-25

Gericke, N., Boeve-de Pauw, J., Berglund, T., & Olsson, D. (2019). The Sustainability Consciousness Questionnaire: The theoretical development and empirical validation of an evaluation instrument for stakeholders working with sustainable development. *Sustainable Development, 27*(1), 35–49. https://doi.org/10.1002/sd.1859

Gifford, R., Kormos, C., & McIntyre, A. (2011). Behavioral dimensions of climate change: Drivers, responses, barriers, and interventions. *Wiley Interdisciplinary Reviews: Climate Change, 2*(6), 801–827.

Gutfeld, R. (1991). Eight of 10 Americans are environmentalists, at least so they say. *Wall Street Journal, 218*(24), A1–A4.

Heckhausen, J., Wrosch, C., & Schulz, R. (2010). A motivational theory of life-span development. *Psychological Review, 117*(1), 32–60. https://doi.org/10.1037/a0017668

Hodge, K., Lonsdale, C., & Jackson, S. A. (2009). Athlete engagement in elite sport: An exploratory investigation of antecedents and consequences. *The Sport Psychologist, 23*, 186–202.

Hong, S.-M., Giannakopoulos, E., Laing, D., & Williams, N. A. (1994). Psychological reactance: Effects of age and gender. *The Journal of Social Psychology, 134*(2), 223–228. https://doi.org/10.1080/00224545.1994.9711385

Hong, S.-M., & Page, S. (1989). A psychological reactance scale: Development, factor structure and reliability. *Psychological Reports, 64*(3c), 1323–1326. https://doi.org/10.2466/pr0.1989.64.3c.1323

Hu, L. T., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Inman, R. A., Moreira, P. A. S., Cunha, D., & Castro, J. (2020). Assessing the dimensionality of the student school engagement survey: Support for a multidimensional bifactor model. *Revista de Psicodidáctica, 25*(2), 109–118. https://doi.org/10.1016/j.psicoe.2020.03.001

Inman, R. A., Moreira, P. A. S., Faria, S., Pedras, S., & Correia Lopes, J. (2021). *Adolescent engagement (and disengagement) with sustainable development: Associations with basic psychological need satisfaction and wellbeing* [Unpublished manuscript]. Porto: Universidade Lusíada Norte.

Inman, R. A., Sousa, A. M., Cunha, D., & Moreira, P. A. S. (2019). Therapeutic reactance in adolescents: The psychometrics of the therapeutic reactance scale in adolescents. *Scandinavian Journal of Child and Adolescent Psychiatry and Psychology, 7*, 20–28. https://doi.org/10.21307/sjcapp-2019-003

IPCC. (2014). *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change.* Geneva, Switzerland: IPCC.

IPCC. (2021). *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change.* Cambridge: Cambridge University Press. https://www.ipcc.ch/report/ar6/wg1/downloads/report/IPCC_AR6_WGI_Full_Report.pdf.

Jang, H., Reeve, J., & Deci, E. L. (2010). Engaging students in learning activities: It is not autonomy support or structure but autonomy support and structure. *Journal of Educational Psychology, 102*(3), 588–600. https://doi.org/10.1037/a0019682

Jensen, A. R. (1998). *The g factor: The science of mental ability* (Westport).

Jimerson, S. R., Campos, E., & Greif, J. L. (2003). Toward an understanding of definitions and measures of school engagement and related terms. *California School Psychologist, 8*(1), 7–27. https://doi.org/10.1007/bf03340893

Just, C. (2011). A review of literature on the general factor of personality. *Personality and Individual Differences, 50*(6), 765–771. https://doi.org/10.1016/j.paid.2011.01.008

Kahn, W. A. (1990). Psychological conditions of personal engagement and disengagement at work. *Academy of Management Journal, 33*(4), 692–724.

Kaiser, F. G., & Byrka, K. (2011). Environmentalism as a trait: Gauging people's prosocial personality in terms of environmental engagement. *International Journal of Psychology, 46*(1), 71–79. https://doi.org/10.1080/00207594.2010.516830

Lee, J. S. (2014). The relationship between student engagement and academic performance: Is it a myth or reality? *Journal of Educational Research, 107*(3), 177–185. https://doi.org/10.1080/00220671.2013.807491

Li, Y., & Lerner, R. M. (2011). Trajectories of school engagement during adolescence: Implications for grades, depression, delinquency, and substance use. *Developmental Psychology, 47*(1), 233–247. https://doi.org/10.1037/a0021307

Lonsdale, C., Hodge, K., & Raedeke, T. (2007). Athlete engagement I: A qualitative investigation of relevance and dimensions. *International Journal of Sport Psychology, 38*, 451–470.

Marks, H. M. (2000). Student engagement in instructional activity: Patterns in the elementary, middle, and high school years. *American Educational Research Journal, 37*(1), 153–184. https://doi.org/10.3102/00028312037001153

Meyer, J. P., & Gagné, M. (2008). Employee engagement from a self-determination theory perspective. *Industrial and Organizational Psychology, 1*, 60–62.

Milfont, T. L., & Fischer, R. (2010). Testing measurement invariance across groups: Applications in cross-cultural research. *International Journal of Psychological Research, 3*(1), 111–130. https://doi.org/10.21500/20112084.857

Milfont, T. L., & Sibley, C. G. (2012). The big five personality traits and environmental engagement: Associations at the individual and societal level. *Journal of Environmental Psychology, 32*(2), 187–195. https://doi.org/10.1016/j.jenvp.2011.12.006

Moreira, P. A. S. (2017). *The Portuguese Longitudinal Study of Student Engagement with Sustainable Development (PTDC/ CED-EDG/31615/2017).* Retrieved from osf.io/tjmb6.

Moreira, P. A. S. (2021). The youth engagement with global sustainability inventory (YEGSI): Development and validity-based studies (inventario de Compromiso juvenil con la Sostenibilidad: Estudios de desarrollo y validez). *PsyEcology, 12*(2), 228–253. https://doi.org/10.1080/21711976.2021.1891759

Moreira, P. A. S., Cunha, D., & Inman, R. A. (2020a). Addressing a need for valid measures of trait reactance in adolescents: A further test of the Hong psychological reactance scale. *Journal of Personality Assessment, 102*(3), 357–369. https://doi.org/10.1080/00223891.2019.1585360

Moreira, P. A. S., Cunha, D., & Inman, R. A. (2020b). An integration of multiple student engagement dimensions into a single measure and validity-based studies. *Journal of Psychoeducational Assessment, 38*(5), 564–580. https://doi.org/10.1177/0734282919870973

Moreira, P. A. S., Faria, V., Cunha, D., Inman, R. A., & Rocha, M. (2020). Applying the transtheoretical model to adolescent academic performance using a person-centered approach: A latent cluster analysis. *Learning and Individual Differences, 78*. https://doi.org/10.1016/j.lindif.2019.101818

Moreira, P. A. S., Inman, R. A., & Cloninger, C. R. (2021a). Reactance and personality: Assessing psychological reactance using a biopsychosocial and person-centered approach. In *Current psychology*. Advance online publication. https://doi.org/10.1007/s12144-020-01310-1.

Moreira, P. A. S., Inman, R. A., & Cloninger, C. R. (2021b). Virtues in action are related to the integration of both temperament and character: Comparing the VIA Classification of Virtues and Cloninger's Biopsychosocial Model of Personality. *The Journal of Positive Psychology.* https://doi.org/10.1080/17439760.2021.1975158. Advance online publication.

Moreira, P. A. S., Inman, R. A., Cloninger, K. M., & Cloninger, C. R. (2021). Student engagement with school and personality: A biopsychosocial and person-centred approach. *British Journal of Educational Psychology, 91*, 691–713. https://doi.org/10.1111/bjep.12388

Moreira, P. A. S., Inman, R. A., & Cunha, D. (2020). The resistance to change scale: Assessing dimensionality and associations with personality and wellbeing in adolescents. *Journal of Personality Assessment, 102*(5), 604–615. https://doi.org/10.1080/00223891.2019.1676761

Moreira, P. A. S., Loureiro, A., Inman, R. A., & Olivos-Jara, P (2021). Assessing the unidimensionality of Clayton's Environmental Identity Scale using confirmatory factor analysis (CFA) and bifactor exploratory structural equation modeling (bifactor-ESEM). *Collabra: Psychology.* https://doi.org/10.1525/collabra.28103. In press.

Moreira, P. A. S., Ramalho, S., & Inman, R. A. (2020). The engagement/disengagement in sustainable development inventory (EDiSDI): Psychometric properties and validity-based studies. *European Journal of Psychological Assessment, 37*, 344–356. https://doi.org/10.1027/1015-5759-a000619

Natriello, G. (1984). Problems in the evaluation of students and student from secondary schools. *Journal of Research & Development in Education, 17*, 14–24.

Nguyen, T. D., Cannata, M., & Miller, J. (2018). Understanding student behavioral engagement: Importance of student interaction with peers and teachers. *Journal of Educational Research, 111*(2), 163–174. https://doi.org/10.1080/00220671.2016.1220359

Nielsen, K. S., Clayton, S., Stern, P. C., Dietz, T., Capstick, S., & Whitmarsh, L. (2021). How psychology can help limit climate change. *American Psychologist, 76*(1), 130–144. https://doi.org/10.1037/amp0000624

Nisbet, E. K., & Zelenski, J. M. (2013). The NR-6: A new brief measure of nature relatedness. *Frontiers in Psychology, 4*, 813. https://doi.org/10.3389/fpsyg.2013.00813

Nisbet, E. K., Zelenski, J. M., & Murphy, S. A. (2009). The nature relatedness scale: Linking individuals' connection with nature to environmental concern and behavior. *Environment and Behavior, 41*(5), 715–740. https://doi.org/10.1177/0013916508318748

Oreg, S. (2003). Resistance to change: Developing an individual differences measure. *Journal of Applied Psychology, 88*(4), 680–693. https://doi.org/10.1037/0021-9010.88.4.680

Putnick, D. L., & Bornstein, M. H. (2016). Measurement invariance conventions and reporting: The state of the art and future directions for psychological research. *Developmental Review, 41*, 71–90. https://doi.org/10.1016/j.dr.2016.06.004

R Core Team. (2019). R: A language and environment for statistical computing. *R Core Team.*

Ree, M. J., Carretta, T. R., & Teachout, M. S. (2015). Pervasiveness of dominant general factors in organizational measurement. *Industrial and Organizational Psychology: Perspectives on Science and Practice, 8*(3), 409–427. https://doi.org/10.1017/iop.2015.16

Reise, S. P., Bonifay, W. E., & Haviland, M. G. (2013). Scoring and modeling psychological measures in the presence of multidimensionality. *Journal of Personality Assessment, 95*(2), 129–140. https://doi.org/10.1080/00223891.2012.725437

Reise, S. P., Scheines, R., Widaman, K. F., & Haviland, M. G. (2013). Multidimensionality and structural coefficient bias in structural equation modeling: A bifactor perspective. *Educational and Psychological Measurement, 73*(1), 5–26. https://doi.org/10.1177/0013164412449831

Rokeach, M. (1973). *The nature of human values.* Free Press.

Rothbard, N. P. (2001). Enriching or depleting? The dynamics of engagement in work and family roles. *Administrative Science Quarterly, 46*(4), 655–684. https://doi.org/10.2307/3094827

Schaufeli, W. B. (2013). What is engagement? In C. Truss, K. Alfes, R. Delbridge, A. Shantz, & E. Soane (Eds.), *Employee engagement in theory and practice* (pp. 15–35). Routledge. https://doi.org/10.4324/9780203076965.

Sharma, K., & Bansal, M. (2013). Environmental consciousness, its antecedents and behavioral outcomes. *Journal of Indian Businses Research, 5*(3), 198–214.

Skinner, E. A., Kindermann, T. A., & Furrer, C. J. (2009). A motivational perspective on engagement and disaffection. *Educational and Psychological Measurement, 69*(3), 493–525. https://doi.org/10.1177/0013164408323233

Soane, E., Shantz, A., Alfes, K., Truss, C., Rees, C., & Gatenby, M. (2013). The association of meaningfulness, well-being, and engagement with absenteeism: A moderated mediation model. *Human Resource Management, 52*(3), 441–456. https://doi.org/10.1002/hrm.21534

Steg, L., Perlaviciute, G., van der Werff, E., & Lurvink, J. (2014). The significance of hedonic values for environmentally relevant attitudes, preferences, and actions.

Environment and Behavior, 46(2), 163–192. https://doi.org/10.1177/0013916512454730

Stern, P. C. (2011). Contributions of psychology to limiting climate change. *American Psychologist, 66*(4), 303–314. https://doi.org/10.1037/a0023235

Stern, P. C., Dietz, T., Abel, T., Guagnano, G. A., & Kalof, L. (1999). A value-belief-norm theory of support for social movements: The case of environmentalism. *Human Ecology Review, 6*(2), 81–97.

Stern, P. C., Dietz, T., & Guagnano, G. A. (1998). A brief inventory of values. *Educational and Psychological Measurement, 58*(6), 984–1001. https://doi.org/10.1177/0013164498058006008

Tam, K. P. (2013). Concepts and measures related to connection to nature: Similarities and differences. *Journal of Environmental Psychology, 34*, 64–78. https://doi.org/10.1016/j.jenvp.2013.01.004

United Nations General Assembly. (2015). *Transforming our world: The 2030 agenda for sustainable development.* United Nations General Assembly.

Van Den Broeck, A., Vansteenkiste, M., De Witte, H., & Lens, W. (2008). Explaining the relationships between job characteristics, burnout, and engagement: The role of basic psychological need satisfaction. *Work & Stress, 22*(3), 277–294. https://doi.org/10.1080/02678370802393672

Vandenberg, R., & Lance, C. (2000). A review and synthesis of the measurement invariance literature: Suggestions, practices, and. *Organizational Research Methods, 3*(1), 4–70. http://orm.sagepub.com/cgi/content/abstract/3/1/4.

Venhoeven, L. A., Bolderdijk, J. W., & Steg, L. (2013). Explaining the paradox: How pro-environmental behaviour can both thwart and foster well-being. *Sustainability, 5*(4), 1372–1386. https://doi.org/10.3390/su5041372

Wang, M. T., & Degol, J. (2014). Staying engaged: Knowledge and research needs in student engagement. *Child Development Perspectives, 8*(3), 137–143. https://doi.org/10.1111/cdep.12073

Wang, M. T., Degol, J. L., & Henry, D. A. (2019). An integrative development-in-sociocultural-context model for children's engagement in learning. *American Psychologist, 74*(9), 1086–1102. https://doi.org/10.1037/amp0000522

Wang, M. T., Fredricks, J., Ye, F., Hofkens, T., & Linn, J. S. (2019). Conceptualization and assessment of adolescents' engagement and disengagement in school: A multidimensional school engagement scale. *European Journal of Psychological Assessment, 35*(4), 592–606. https://doi.org/10.1027/1015-5759/a000431

World Commission on Environment and Development. (1987). *Our common future.* Oxford University Press.

Wray-Lake, L., DeHaan, C. R., Shubert, J., & Ryan, R. M. (2019). Examining links from civic engagement to daily well-being from a self-determination theory perspective. *The Journal of Positive Psychology, 14*(2), 166–177. https://doi.org/10.1080/17439760.2017.1388432

Wrosch, C., Scheier, M. F., Miller, G. E., Schulz, R., & Carver, C. S. (2003). Adaptive self-regulation of unattainable goals: Goal disengagement, goal reengagement, and subjective well-being. *Personality and Social Psychology Bulletin, 29*(12), 1494–1508. https://doi.org/10.1177/0146167203256921

Zaff, J., Boyd, M., Li, Y., Lerner, J. V., & Lerner, R. M. (2010). Active and engaged citizenship: Multi-group and longitudinal factorial analysis of an integrated construct of civic engagement. *Journal of Youth and Adolescence, 39*, 736–750.

Zwir, I., Arnedo, J., Del-Val, C., Pulkki-Råback, L., Konte, B., Yang, S. S., et al. (2020a). Uncovering the complex genetics of human character. *Molecular Psychiatry, 25*, 2295–2312. https://doi.org/10.1038/s41380-018-0263-6

Zwir, I., Arnedo, J., Del-Val, C., Pulkki-Råback, L., Konte, B., Yang, S. S., et al. (2020b). Uncovering the complex genetics of human temperament. *Molecular Psychiatry, 25*, 2275–2294. https://doi.org/10.1038/s41380-018-0264-5

Zwir, I., Del-Val, C., Arnedo, J., Pulkki-Råback, L., Konte, B., Yang, S. S., et al. (2019). Three genetic–environmental networks for human personality. *Molecular psychiatry.* Advance online publication. https://doi.org/10.1038/s41380-019-0579-x

Zwir, I., Del-Val, C., Hintsanen, M., Cloninger, K. M., Romero-Zaliz, R., Mesa, A., et al. (2021). Evolution of genetic networks for human creativity. *Molecular psychiatry.* Advance online publication. https://doi.org/10.1038/s41380-021-01097-y