Descriptive norms, personal values, organizational pro-environmental support: Providing intrinsic or extrinsic attributions to increase pro-environmental behaviors

Abstract

In response to the climate crisis, organizations are encouraging employees to adopt pro-environmental behavior (PEB). While descriptive norm interventions (e.g., many people engaging in PEBs) are generally positive, mixed findings suggest an alternative approach may maximize effects. Using self-concordance theory, we hypothesize that the attribution of normative behavior (intrinsic/extrinsic) interacts with personal values to motivate behavior, especially for those with extrinsic values. In a time-lagged experiment with 1712 participants, we tested descriptive norms with either intrinsic or extrinsic attributions, a norm-only condition, or no norm. Surprisingly, self-concordant attributions did not increase PEB, and extrinsic attributions led to a greater increase than intrinsic or norm-only conditions. Organizational pro-environmental support correlated independently with PEB but the moderation effect was non-significant. These counterintuitive findings suggest further exploration and implications for future research.

Keywords: Pro-environmental behavior, descriptive norms, goal framing, intrinsic/ extrinsic values, self-concordance, organizational pro-environmental support

Introduction

Since January 2023, organizations around the world are reporting their social and environmental impact, increasing the need to set up pro-environmental interventions (Finance, 2024). Environmental interventions based on the organization's green support, policies, and norms (Norton et al., 2012; Robertson & Barling, 2013) can increase, not only the attractiveness of the company (Behrend et al., 2009) and employees' well-being and life satisfaction (Berger et al., 2023; Kaida & Kaida, 2016), but also the employees' willingness to participate in pro-environmental behaviors (PEB) such as turning off lights, using reusable cups, and utilizing public transportation to commute to work (e.g., Lindenberg & Steg, 2007, 2014). It is not surprising, therefore, that a substantial body of research is focused on interventions and how to establish organizational pro-environmental norms (e.g., Davis et al., 2020; George et al., 2020; Lindenberg & Steg, 2007).

Descriptive norm-based interventions (i.e., highlighting what other people are doing) are widely used and shown to be effective in encouraging PEBs (e.g., Berger et al., 2023; Ejelöv et al., 2022). However, such interventions are not always positive, with research indicating differences depending upon the attribution of the normative behavior (Ejelöv et al., 2022) and the context (e.g., Richter et al., 2018). Moreover, because organizations provide a context that is extrinsically-oriented and draws on external regulation (e.g., incentives, to-do lists, performance management; (Jenkins et al., 1998; Maki et al., 2016), the traditional use of internal attributions for the normative behavior (e.g., Ejelöv et al., 2022) may not be appropriate.

Therefore, we examine the conditions under which internal and external attributions of normative behaviour will result in employee PEB at work. We posit that the traditional SDT approach that advocates "intrinsic is always best" is too simplistic to understand PEB in an externally-oriented setting such as the workplace. Instead, we draw on self-concordance theory (Cropanzano et al., 1993; Sheldon & Emmons, 1995; Unsworth et al., 2014) to suggest that the most effective intervention will depend on "fit". First, we suggest that individual values and the workplace-based descriptive norm intervention should align (see e.g., Unsworth et al., 2013). The intervention that is self-concordant (the participant has intrinsic values and views intrinsic attributions for the normative behavior OR the participant has extrinsic values and views extrinsic normative attributions) should be more effective than the intervention that is not self-concordant. Second, we suggest that this alignment will be strengthened by a fit with the context, namely organisational support for the environment. Thus, when the external environment appreciates and supports the behavior, participants who view extrinsic attributions for the normative behavior will have an even stronger connection to their extrinsic values, leading to stronger engagement in the behavior.

This pre-registered time-lagged study design grounded in three pre-studies aims to make several contributions. First, while intrinsic framing of PEB interventions is commonly perceived as more effective (e.g., Vansteenkiste et al., 2006) than extrinsic framing, some studies suggest that extrinsic incentives in organizations can yield positive outcomes. By finding explanations for why this might be the case, we contribute to the goals and norms research (e.g., Deci & Ryan,

1985; Ejelöv et al., 2022; Vansteenkiste et al., 2006) as well as providing guidelines for organizational norm-interventions.

Secondly, existing research on goal and norm framings neglects the three-way interaction between individual values, normative attributions, and the organizational pro-environmental support. Only a few studies examine the two-way interaction between individual values and organizational environments (Lu et al., 2019), but the vast majority focuses on either the individual (e.g., Davis & Challenger, 2013) or the context, such as organizational cultures (e.g., Egri & Herman, 2000; Graves et al., 2013; Papagiannakis & Lioukas, 2012). As human behavior is inherently intertwined with its context (Ajzen & Madden, 1986), exploring the effects of both personal values, organizational norms, and organizational environments enables a more comprehensive understanding of self-rated behavior.

Thirdly, we explore the PEBs of double-sided printing, thoughtful planning of work trips, discussing energy consumption with colleagues, monitoring water usage at work, and encouraging colleagues to consider their energy use. At first glance, these seem to have a small impact and fall into the major critique of how behavioral scientists have studied PEB in the past investigating pro-environmental actions with minimal effects on the CO_2 emissions. However, there are several arguments in favor of investigating small PEBs. First, research shows that engaging in small PEBs at work can lead to spillover effects in other areas of life (Verfuerth & Gregory-Smith, 2018; (Jaich et al., 2023). Additionally, small contributions can lead to larger ones. For instance, the study by Thøgersen and Noblet (2012) demonstrates that small PEBs predict acceptance of wind power on a larger scale. Second, small contributions at work help

establish important norms that shape organizational culture (Hickleton et al., 2019 ; (Berger et al., 2023). Small, visible PEBs, like turning off lights, can signal environmental awareness and foster a broader sense of responsibility among employees. Research shows that PEBs are influenced by social pressures and norms (Trelohan, 2021). When employees observe their peers engaging in small PEBs, they may feel social pressure or be inspired to follow suit. Over time, this can contribute to shifting organizational norms and fostering more comprehensive sustainability practices (Hickleton et al., 2019). Third, the cumulative impact of small PEBs is often overlooked. While individually small, these behaviors can have a significant environmental impact when aggregated across a large organization. The argument that such behaviors have a small impact compared to other actions can be applied to many situations. As Lamb (2020) describes, this is a common argument called *Whataboutism* in the climate discourse: "It makes no sense for a village to invest in solar panels if the rest of the country does not." Similarly, “It does not make sense for a small country (e.g., Germany) to set policies if a larger country (e.g., the USA) continues fracking.” This argument leads to a vicious cycle where no action is taken, preventing progress (Lamb, 2020). Fourth, small PEBs can foster a sense of personal commitment and psychological responsibility toward larger environmental goals. While large-scale structural changes are important, they often require more time, resources, and political will. In contrast, small PEBs are easier to implement and can yield immediate results, making them appealing for organizations.

We also make empirical and methodological contributions. Pre-registering the study reduces post-hoc hypothesis guessing, the time-lagged design provides insights into changes at self-rated PEB at work over two working weeks, and the pre-studies validated different attributions for acting pro-environmentally. In addition, we analyzed data with a latent change score model (LCS) that both overcomes limitations of difference scores and removes error variance thus improving upon the traditional MANOVA approach (Matusik et al., 2020). Taken together, this time-lagged experimental study contributes to the different findings in descriptive norms research and suggests guidelines for organizational practitioners wishing to set up pro-environmental norms. The conceptual model can be seen in Figure 1.

Theory and Hypotheses

Effect of Descriptive Norms on PEB

Social norms are the implicit guidelines that influence group behavior and shape what is considered appropriate in various contexts, including within organizations (Cialdini & Trost, 1998). Social norms, as outlined by Cialdini et al. (1990), can be categorized as either injunctive norms that indicate what is approved or descriptive norms that reflect what is observed. Thus, descriptive norms are perceptions of the prevalent behavior of others (Cialdini et al., 1990). For example, if an employee sees that many of their colleagues are pro-environmental, then they perceive a descriptive norm around PEBs (Goldstein et al., 2008). Descriptive norms have been shown to be more effective in fostering proactive employee (green) contributions compared to injunctive norms (Bastini et al., 2023; Norton et al., 2014, Jaich, 2024)(https://link.springer.com/article/10.1007/s41471-023-00167-x). However, the positive effects of

descriptive norms cannot be taken for granted – research has shown that they can have no significant effect or even boomerang (reverse) effects on PEB (e.g., Cialdini et al., 1991; Richter et al., 2018; Smith et al., 2012). For instance, Bastini et al. (2023) identified potential backfiring effects whereby, in some cases, emphasizing the high levels of environmentally friendly behavior among peers led to a demotivating effect.

To investigate one reason for these mixed findings, we integrate the literatures of descriptive norms and self-concordance (Sheldon & Elliot, 1999). The three key elements of a norm-based organizational intervention are the attribution of the descriptive norm (why are people engaging in PEB), the individual (why would I want to engage in PEB), and the context (why would my organization want me to engage in PEB) (Cialdini & Goldstein, 2004). Self-concordance is the most appropriate theoretical framework to develop our understanding of descriptive norms as it highlights the connections across these different elements, through its emphasis on aligning personal values and organizational contexts to create sustainable behavioral change (Unsworth et al., 2014).

First, scanning the literature on all three elements, we know that descriptive norms can be attributed to either intrinsic attributions, such as environmental concern and stewardship, or extrinsic attributions, such as seeking social recognition (Ejelöv et al., 2022; Paillé & Boiral, 2013). Studies indicate that normative PEBs perceived to result from intrinsic motives tend to outperform those perceived to be driven by extrinsic motives (Ejelöv et al., 2022). This is in line with other research demonstrating that emphasizing intrinsic attributions, such as moral duty,

tends to be more effective in promoting pro-environmental actions compared to extrinsic attributions (Lindenberg & Steg, 2007; Vansteenkiste et al., 2006; Vansteenkiste et al., 2008).

This line of research is often associated with self-determination theory (SDT; Deci & Ryan, 2000) suggesting that the intrinsic attribution of descriptive norms signals that the behavior is performed out of intrinsic motivation (e.g., Nolan et al., 2008; Van Der Werff et al., 2013). However, this theorizing is based on an implicit assumption - that the intrinsic attribution helps individuals to achieve the intrinsic values towards which everybody naturally strives (Sheldon & Kasser, 1995). Values are individuals' personal aspirations and long-term strivings that guide our behaviors (Pryor, 1982; Schwartz, 1992, 1994) and SDT traditionally differentiates between intrinsic values (e.g., striving for maintaining long and meaningful relationships or positively contributing to the community) and extrinsic values[1] (e.g., striving for financial success, fame, or attaining power) (Kasser & Ryan, 1993, 1996). The existing findings might, therefore, arise from the coherence, or self-concordance, of the intrinsic attribution with the intrinsic values held by participants (Cropanzano et al., 1993; Kruglanski, 2013; Little et al., 1992; Sheldon & Elliot, 1999; Unsworth et al., 2014) rather than the intrinsic attribution per se. This is an important distinction to make because we argue that, particularly in an organizational context, not

[1] Intrinsic and extrinsic values should not be confounded with intrinsic and extrinsic motivation. While intrinsic and extrinsic values pertain to *what* people strive for and want to achieve, intrinsic and extrinsic motivation refers to *the reasons why* people engage in particular activities (Deci, 1975; Deci & Ryan, 1985). However, combining the value theory with the motivation theory, previous studies showed a tendency for individuals to exhibit greater levels of intrinsic motivation when pursuing intrinsic values, while experiencing a sense of being controlled when pursuing extrinsic values. But, both intrinsic and extrinsic values can be pursued out of extrinsic and intrinsic reasons, respectively (Deci & Ryan, 2000).

everybody will hold intrinsic values and, indeed, intrinsic values are less salient than extrinsic ones (Deci & Ryan, 2000; Van den Broeck et al., 2016).

Self-concordance (Cropanzano et al., 1993), coherence (Sheldon & Kasser, 1995) and means-end relationships (Kruglanski, 2013) all refer to the concept of a fit between one's possible actions and one's values – when there is alignment, or fit, then motivation is strong (Sheldon & Emmons, 1995; Unsworth & McNeill, 2017). While some research finds that congruence of a behavior with intrinsic values leads to more positive outcomes than coherence with extrinsic values (Sheldon & Kasser, 1995), a large section of other research shows that it is the fit, and not the intrinsic or extrinsic nature of the values or behavior that is important (e.g., Kruglanski, 2013; Unsworth & McNeill, 2017). Indeed, research by Unsworth and McNeill (2017) supports this idea for PEBs, demonstrating that individuals were more likely to engage in PEB when instructions activated self-concordant higher-order values, even when these values were not intrinsic. In three studies, they found that stronger alignment between environmentally sustainable behaviors and personal values increased intentions to engage in sustainable energy use and commuting behaviors, even after accounting for factors such as political orientation and environmental concerns. Therefore, we suggest that variations in self-concordance regarding personal values may influence the success or failure of the descriptive norm intervention.

More specifically, we hypothesize that when the attribution of a descriptive norm is based on intrinsic reasons, and the employee has intrinsic values, then they are likely to see a stronger fit, and stronger intentions to engage, than when the norm is based on extrinsic reasons; and vice versa. For example, when an employee with extrinsic values is told that many people are

engaging in PEBs to gain social recognition (extrinsic attribution of descriptive norm), they will believe that the behavior will help them to achieve their own extrinsic values, leading to high levels of self-concordance and motivation to engage in PEB; alternatively, if the same person is told that many people are engaging in PEBs to help the environment (intrinsic attribution of descriptive norm), this will lead them to believe that the behavior will not help them to achieve their extrinsic values, thus decreasing their self-concordance and subsequent motivation to engage in PEB. Thus, we hypothesize that self-concordance (the participant has intrinsic values and sees an intrinsic attribution of the descriptive norm OR the participant has extrinsic values and sees an extrinsic attribution of the descriptive norm) enhances self-rated PEB. In addition, we include a norm-only group (control group) to test whether the different attributions in combination with the descriptive norm framings are the reasons for an increase in PEB, or whether the descriptive norm framings alone are sufficient. If the latter is true, organizations could simplify their goals by providing only descriptive norm framings.

Hypothesis 1: Self-concordance between employees' values and descriptive norm attributions leads to higher increases in self-rated PEB than non-self-concordance or no descriptive norm attribution, a norm-only group (control group).

Enhancing concordance between normative behavior attributions and values via organizational pro-environmental support

We know that context matters for PEB: green work environments and pro-environmental support motivate employees to engage in PEB (e.g., Paillé & Boiral, 2013; Paillé & Mejía-Morelos, 2014; Ruepert et al., 2017, Zhang et al. 2024). This is also the case for norm-guided

behavior where, in general, people are more likely to choose pro-environmental products rather than luxury products when these choices are made in public settings (Griskevicius et al., 2010), and norm-guided behavior occurs less often in darkness (Zhong et al., 2010) and when not publicly-observed (Bateson et al., 2006).

Based on self-concordance theorizing (e.g., Unsworth et al., 2014), we argue that the presence of a context that strengthens the connection between the behavioral attribution and the value will thereby strengthen the motivation to engage in that action (e.g., Unsworth et al., 2013). For example, a supportive audience will facilitate the achievement of extrinsic recognition values when engaging in PEB thereby strengthening the connection between the extrinsic attribution of the descriptive norm and personal extrinsic values. In contrast, an indifferent audience, by definition, will not help an employee achieve their extrinsic recognition values, even if there are normative reasons to engage, thus negating the connection between the attribution and the value. We posit that the audience will be particularly relevant for those with extrinsic values because, while intrinsic values are autonomously driven, the pursuit of extrinsic values is dependent on reactions to, and comparisons with, other people (e.g., Deci & Ryan, 2000; Duriez et al., 2007). Research has shown, for example, that those striving towards extrinsic values have different levels of PEB depending upon whether the setting is public or private (Lu et al., 2019), unlike those striving for intrinsic values (Unanue et al., 2016). Similarly, green organizational supportive norms have been shown to motivate extrinsic-oriented employees to engage in PEB (Lu et al., 2019; Ruepert et al., 2017). In other words, an organizational context that provides recognition and appreciation for employee PEBs creates concordance between the normative

action and extrinsic values, but not with intrinsic values. We argue, therefore, that providing an extrinsic attribution for PEB descriptive norms will only be successful when there is a fit with both employees' extrinsic values and organizational pro-environmental support, defined as the complement of extrinsic contents—namely, providing the necessary infrastructure, support systems, and an appreciative environment. However, the success of an intrinsic attribution for PEB descriptive norms only requires a fit with employees' intrinsic values.

Hypothesis 2: There will be a three-way interaction such that organizational pro-environmental support strengthens the relationship between employees' extrinsic values and the increase in self-rated PEB when receiving extrinsic attributions compared to intrinsic attributions (group 1), norm only (group 3), or nothing (control group).

In summary, we extend our understanding of pro-environmental norm interventions in organizations by going beyond the traditional approach of intrinsically-based descriptive norms and developing more nuanced hypotheses based on self-concordance and organizational pro-environmental support. We now describe the pilot studies used to ground the research and the pre-registered study.

Method

Pilot Studies: Finding and validating intrinsic and extrinsic attributions

Before conducting our main study, three pre-studies were carried out to collect and validate intrinsic and extrinsic attributions for normative behavior. Please note that all pre-studies were also part of other larger projects, which is why the framing was not entirely focused on work contexts or descriptive norms.

In the first pre-study, we formed four focus groups with three participants in each to brainstorm reasons for PEB. Participants were instructed to write down all attributions for why people behave in an environmentally friendly manner. There were no instructions for any specific PEB, so they could collect attributions for actions such as saving water at home or taking public transport to work (e.g., "Using rainwater for watering plants and choosing to shower instead of taking baths leads to water conservation. As a result, fewer rivers need to be pumped dry in the summer, and the supply of food and medicines can continue."). Although we also collected these different PEBs in a separate file (see Appendix A), our focus was on the attributions. In the next step, participants were asked to categorize the attributions into intrinsic and extrinsic categories. To aid in this task, they were provided with definitions of intrinsic and extrinsic content. The definitions were: "Intrinsic content includes contributions to the environment, personal development, or caring for others, whereas extrinsic content includes social recognition, financial success, or power." We collected all the attributions and scanned them for similar characteristics. For example, attributions like "People behave pro-environmentally to contribute to natural reserves" and "People behave pro-environmentally to rescue biodiversity" were grouped together. By matching similar attributions, we shortened the list to a set of 26 attributions (see Appendix B).

In our second pilot study, we conducted an online survey involving 58 psychology students to check for initial levels of reliability (Cronbach's alpha and intra-class coefficient, ICC) and differentiation between intrinsic and extrinsic attributions (paired sample t-test to test within-person differences), to modify items to improve clarity and work-relevance, and to reduce

the number of items based on the highest levels of importance and work-relevance. Cronbach's alpha for intrinsic attributions was .89 and for extrinsic attributions .93, indicating good internal reliability. The ICC of .994 indicated excellent agreement among the raters (with ICC = 1 representing perfect alignment). The importance of the intrinsic attributions were rated significantly higher (M = 5.12) than the extrinsic attributions (M = 4.93) as indicated by a significant t-test, $t(52) = 2.29$, $p < .05$. This finding indicates predictive validity in that there are significant differences in the intrinsic and extrinsic differentiation of attributions. We adapted the list according to the feedback on clarity (that was collected in an open field) and the behaviors that could be performed at work. Additionally, we tailored the reasons more closely to the framing of the intrinsic and extrinsic value scale by using similar terms (e.g., intrinsic attributions: "contributes to nature conservation and the preservation of biodiversity" and intrinsic value scale: "I can make a small contribution to make the world a better place"). A list of sixteen attributions, eight intrinsic and eight extrinsic, was created (see Appendix C).

In the final pre-study, we used these sixteen items with 223 participants (135 women, 86 men, and 2 non-binary individuals), who were randomly divided into two groups receiving either intrinsic or extrinsic attributions for a PEB to check for reliability (Cronbach's alpha) and validity (between-person t-test differentiating intrinsic and extrinsic attributions on importance). On average, participants were 35.75 years old (SD = 11.52), worked 36.06 hours per week (SD = 12.31), and had an average organizational tenure of 9.51 years (SD = 10.05). Cronbach's alpha for intrinsic attributions were .91 and for extrinsic attributions .80, again indicating strong internal reliability. On average, participants rated intrinsic attributions as more important (M =

5.52, *SD* = 1.31) than extrinsic attributions (*M* = 4.89, *SD* = 1.18). This difference was significant ($t(87)^2 = 2.49$, $p < .05$) with a medium-sized effect ($r = .26$). Supporting this result, the correlations between intrinsic and extrinsic attributions are moderate and support that there are notable differences between intrinsic and extrinsic contents.

To reduce participant load, and given the high internal reliability of the scales, it was decided that five items would be enough to capture the constructs. Therefore, five items from each subscale were chosen based on their importance ratings from this study and the work-relevance ratings from the previous study (see Appendix D).

Main study: Manipulating different attributions to act pro-environmentally

Transparency and Open Science

The study was pre-registered with OSF before data collection[3] to provide the best possible transparency. Please note that the pre-registration stated that we would test our hypotheses using "a moderation analysis (and, if the preconditions are met, a latent model)". Although we had considered a latent model beforehand, we were not familiar with the latent change score analysis at that stage. But as latent change score analysis is the more advanced and appropriate analysis method, we decided to implement it, even though it goes beyond our pre-registration that can be retrieved here. Data, syntax, and study materials can be accessed here.

[2] 89 participants out of 223 rated all assigned attributions and were included in this analysis.
[3] We reframed the hypotheses to make it easier for the reader. As results led to the same discussion, we report intrinsic values and extrinsic values separately (instead of 'extrinsic relative to intrinsic value score') to avoid restriction of variances and to provide the greatest information from data. Link to pre-registration: https://osf.io/6dw9m/?view_only=2c6ead7ef9564ff49fdf4cca12018b72

Sample

For the main study, the sample size was 1712 participants (842 women; 849 men) that were recruited with the ethical online panel provider Prolific (prolific.com). There were 476 participants in group 1, 466 participants in group 2, 460 participants in group 3, and 303 participants in the control group. To participate in the survey, respondents had to be currently employed and to have at least one leader (i.e., not self-employed). Most participants worked full-time (71.30 %), were born in the United Kingdom and the average age was 38.40 years (SD = 10.69). We chose to go with a small effect size of $f = 0.2$ ("index f is the standard deviation of the k means divided by the pooled within-population standard deviation, and it is considered small if $f = 0.10$, medium if $f = 0.25$, and large if $f = 0.40$", Colman, 2009) as previous studies on text messages have found only small to medium effects when examining messaging interventions (e.g., Webb et al., 2010; Wolstenholme et al., 2020). Thus, like many others in the psychological research field, we took a conservative approach in ensuring our research design was able to detect a small effect. Prior sensitivity analysis showed that a sample size of 339 participants in each group is sufficient to detect a small effect size of $f = 0.20$, with $\alpha = 0.05$ and power of 0.85. Although our control group only had 303 participants, a post hoc analysis shows that a total sample size of 1712 for three treatment groups with an effect size of $f = 0.20$ and $\alpha = 0.05$ has a power of 0.98.

Procedure

After finding and validating different attributions for PEB through the pre-studies, we conducted an experimental study with two measurements spaced two weeks apart. In the first

measurement, participants completed an online questionnaire that included items on personal values, organizational pro-environmental support, and PEB at work. At the end of this questionnaire, the last page was the manipulation. Participants were randomly assigned to one of four groups and received different descriptive norm interventions (or, in the case of the control group, none).

To ensure rigor, the first sentence of the manipulation was consistent across groups 1-3 and included the specific PEB targeted by the manipulation. This sentence provided the descriptive norm framing, stating that "More and more people" engage in PEB (Cialdini et al., 2006). The second sentence varied: Groups 1 and 2 received additional attributions for PEB. Group 1 was given an intrinsic attribution (e.g., "With this conscious behavior, they protect biodiversity and our environment"); Group 2 received an extrinsic attribution (e.g., "They often receive admiration for this environmentally conscious behavior"). Group 3 received only the normative information (e.g., "More and more people use energy-saving modes on electronic devices at work"). Group 4, the control group, received neither the normative information nor the intrinsic/extrinsic attribution, so their questionnaire ended one page earlier. Groups 1-3 rated the descriptive norm statements on a 5-point Likert scale ("How important are the following statements to you?"). An overview of the statements is provided in Table 1. Two weeks after the first questionnaire, self-rated PEB at work was measured again.

Measures

Extrinsic and intrinsic values

Values were measured with the 18-item version of the Aspiration Index of Kasser and Ryan (1993) adapted from Klusmann et al. (2005) to fit the working context. Example items are: "It is important for me to have a job in which colleagues care about me and support me" and "It is important for me to have a job in which I have a lot of influence on others". Participants rated each item on a 7-point scale (1 = not important at all, 7 = very important). Cronbach's alpha was .84 for intrinsic values and .88 for extrinsic values.

Organizational pro-environmental support

Organizational pro-environmental support was measured using a short version of the perceived organizational support scale developed Eisenberger et al. (1986) to focus on sustainability. Like others, we used a short version of the organizational support scale (e.g., Eder & Eisenberger, 2008; Marique et al., 2013; Paillé & Boiral, 2013). Specifically, we tailored the scale to assess the perception of pro-environmental policies. The adapted items are: "I think that my organization complies with environmentally-friendly standards," "My organization really cares about the environment," and "My organization appreciates pro-environmental contributions." In a principal component analysis, we found that both the Eigenvalue (2.59) and the Scree Plot revealed one factor for validity. The factor explained 86.4% of the variance in the three items. Participants rated each item on a 7-point scale (1 = strongly disagree, 7 = strongly agree). Cronbach's alpha was .92.

Pro-environmental behavior

PEB was measured with seventeen items that were partly adapted from the Organizational Citizenship Behavior for the Environment scale by Boiral and Paillé (2012) and the pro-environmental behavior list of Blok et al. (2015). We adapted those scales as both presented difficulties in terms of applicability, for instance, Blok et al. (2015) distinguish between heating, printing, drinking, sustainable shopping, computer use, light use, and recycling. As most modern industries have automatic heating systems and light regulation, and not all employees shop at their workplace, we chose the items that were most suitable and applicable for the majority of participants. Additionally, since work travel has the highest CO_2 impact on the environment, we included an item on work travel. As part of a separate study, we also included four items on private PEB: "I buy seasonal and regional food (e.g., apples in winter, berries in summer from farmers in the surrounding area)," "I avoid palm oil products,", "I pay attention to environmental impact when planning my vacations (e.g., no long-distance travel and/or train instead of plane)," and "I avoid purchases from online wholesalers."

For our analyses, we used the five items that were associated with the behaviors targeted in the manipulation, that contained PEB at work and that were not skewed[4]. In a PCA for each measurement point, we found that both the Eigenvalue (Time 1: 2.52 and Time 2: 2.68) and the

[4] As two of the initial items had a strong left-skewed distribution impeding a behavioral increase, we used two related items that were also targeted in the manipulation. The item "I use energy-saving modes of electronic devices at work" was replaced with the item "I encourage my colleagues to think about their energy use." And the item "I use my reusable water bottle and/or reusable coffee mug at work" was replaced with the item "I watch my water consumption.". We conducted the analysis using the pre-registered items (adjusted PEB) and obtained partially consistent results. We found the positive effect of extrinsic attributions on adjusted PEB, but we did not observe significant positive effects of intrinsic values or organizational pro-environmental support on adjusted PEB.

Scree Plot revealed one factor for validity[5]. The factor explained 50.39% of the variance at Time 1 and 53.5% of the variance at Time 2 in the five items. The final items are: "I copy and print double-sided", "I pay attention to environmental impact when planning my work travel (e.g., no long-distance travel and/or train instead of plane).", "I talk with my colleagues about energy consumption", "I watch my water consumption", and "I encourage my colleagues to think about their energy use". Participants rated on a 7-point scale (1 = never, 7 = always). Cronbach's alpha was .73 for PEB at Time 1 and .76 for Time 2.

Attention checks

Participants were invited for the second questionnaire only if they correctly responded to at least three of the five attention checks (e.g., "For quality purposes, please select 'never'"; less than 2% (N=32) were excluded). Six participants were excluded as they had the highest scores of PEB at Time 1 and were not able to increase their PEB any higher.

Results

Table 2 shows the means, standard deviations, and intercorrelations of the study variables. We calculated multiple analyses of variance (MANOVA) to test potential sample differences between the four conditions. Gabriel Test, known for good power for homogenous variances and tight control of the Type I error, was used for post-hoc analysis (Toothaker, 1993). Means of intrinsic values, extrinsic values, self-rated PEB from Time 1 and Time 2, and organizational pro-environmental support did not significantly differ between groups but age did (control group:

[5] The KMO measure confirmed the sampling adequacy for the PCA, with a KMO value of .71 (Time 1) and .73 (Time 2). Bartlett's test of sphericity Time 1 (χ^2 (10) = 2058.64, $p < .001$) and Time 2 (χ^2 (10) = 2379.72, $p < .001$) indicated that the correlations between items were sufficiently large for PCA.

$M_{control}$ = 37.89; $SD_{control}$ = 10.37 vs. intrinsic group: $M_{intrinsic}$ = 39.04; $SD_{intrinsic}$ = 11.26 vs. extrinsic group: $M_{extrinsic}$ = 39.00; $SD_{extrinsic}$ = 10.54, $F(2, 1378) = 3.19$, $p < .05$, $\omega^2 = 0.004$), therefore, age was included as a control variable. Additionally, we investigated whether the assessed importance of reasons differs between groups, $F(2, 1399) = 18.62$, $p < .001$, $\omega^2 = 0.24$. Indeed, those receiving intrinsic attributions viewed their information as significantly more important than those receiving extrinsic attributions or norm only. The norm only group assessed the personal importance significantly higher than the extrinsic group.

With a mixed-model MANOVA, we found a marginally significant interaction between time and condition $F(3, 1708) = 2.57$, $p = .053$, $r = .73$, $\omega^2 = 0.23$, with the extrinsic reason condition appearing to have larger differences in self-rated PEB across time points than other conditions (see Figure 2); however post hoc analyses did not identify any significant differences. Instead, there was an increase in self-rated PEB from Time 1 (M = 3.38, SE = 1.13) to Time 2 (M = 4.21, SE = 1.20) in every group. This finding underlines the need to examine participants' personal values rather than a rely on a simple comparison of messages. Thus, we moved to an LCS model to test our hypotheses.

LCS models are favored over mixed design ANOVA for multiple measurement points due to their ability to model change over time with latent variables, representing within-person changes rather than just group differences at specific points. They handle unevenly spaced or missing data more effectively and rely less on restrictive assumptions like sphericity, unlike traditional ANOVA. LCS models accommodate individual variability in change trajectories, preventing loss of data and providing fit indices such as RMSEA, CFI, and SRMR to assess

model accuracy. They are also capable of testing for measurement invariance over time, which is crucial for studying constructs that may shift in meaning due to manipulation. Overall, LCS models offer greater flexibility, better handle individual differences, and provide a more nuanced understanding of variable evolution compared to traditional ANOVA methods (Kenny et al., 2020; McArdle, 2009; McArdle & Epstein, 1987).

Baseline model

Prior to testing our hypotheses, the Kolmogorov-Smirnov test showed that none of the constructs were normally distributed thus, we followed the recommendation of Olivier and Norberg (2010) and illustrated the distributions with quantile-quantile (Q-Q) plots that have let us assume normal distributions for all constructs. Afterwards, we calculated confirmatory factor analyses (CFA) with the five items of self-rated PEB from Time 1 (CFI = .983, TLI = .958, RMSEA = .074, SRMR = .026) and Time 2 (CFI = .992, TLI = .979, RMSEA = .057, SRMR = .021) and built the baseline model by restricting the invariance in four steps (Table 3). First, we calculated a model with the two latent variables of self-rated PEB from Time 1 and Time 2, allowing them to correlate with each other. Second, referring to Geiser (2010), we included four reference indicator specific variables[6], that were not allowed to correlate with each other nor with other variables in the following models. Third, we assessed the measurement invariance of self-rated PEB by fixing the factor loadings of the same self-rated PEB items and the intercepts of the same PEB items. Fourth, the variances of self-rated PEB items were fixed. To compare these

[6] Except from the first reference item of the CFAs, the two identical items from Time 1 and Time 2 built one indicator-variable.

hierarchical nested models with each other, we used the Chi-square difference test. Table 3 shows that there was strict measurement invariance and interindividual differences in self-rated PEB were stable over time. As can be seen, the PEB scale has high measurement accuracy and this did not change over time. The baseline model confirmed the previous finding that PEB overall increased from Time 1 to Time 2 ($M\Delta = 0.21$, $p < .001$).

Hypothesis testing

Mplus 8 (Muthén & Muthén, 2008) and the restricted maximum likelihood estimation method with robust standard errors were used for estimation because it provides fit indices and standard errors and is robust to both non-normality of data and the applied Likert scales (Hair et al., 2010). The latent construct was formed with the five items of PEB at Time 1 and at Time 2. Latent changes were predicted by personal values, organizational pro-environmental support, the different manipulated groups, and interactions (Figure 3). To compare non-nested models, we used Bayesian information criterion (BIC) and Akaike's information criterion (AIC) (lower values indicate better model fit) as we expected small to moderate effects. As recommended by Funder and Ozer (2019), we interpreted the standardized γ paths.

Hypothesis 1 stated that concordance between the attributions and values would lead to a greater increase in self-rated PEB than non-self-concordant situations. We built two models to test this; they were identical except that one was based on the interaction between intrinsic values and the intrinsic attribution group and the other on extrinsic. For the self-concordance models, we built interactions between mean-centered values and the according dichotomous group variable (receiving intrinsic/extrinsic attributions vs. control group); that is, we built an interaction

between mean-centered intrinsic values and receiving intrinsic attributions (dichotomous variable) and between mean-centered extrinsic values and receiving extrinsic attributions (dichotomous variable). We included the other value (for example, in the intrinsic values/intrinsic attributions self-concordance model, we included extrinsic values) as a control as they correlate with each other. There was acceptable model fit for both self-concordance models (Table 4). However, neither the interaction between intrinsic values and the intrinsic attribution group nor the interaction between extrinsic values and the extrinsic group were significant and affected the increase in self-rated PEB over time. Only intrinsic values were significantly positively related to the increase in self-rated PEB when providing extrinsic attributions (γ_2 = .08, *SE* = 0.03, 95% CI[0.01; 0.14], $p < .05$). We ran robustness checks without the control variables and compared self-concordant against all other experimental conditions and in none of these was the interaction significant. We therefore reject the hypothesis that providing self-concordant attributions led to a higher increase in self-rated PEB.

To test hypothesis 2, stating that organizational pro-environmental support strengthens the relationship between extrinsic values and self-rated PEB dependent on the framing provided, we calculated two-way and three-way interactions with mean-centered extrinsic values, organizational pro-environmental support, and the dichotomous variables of each group vs. all other groups. To confirm the hypothesis the three-way interaction has to be significant. The model fit was good (CFI = .93, TLI = .92, RMSEA = .04, SRMR = .04) but none of the interactions were significant (Table 4), indicating that organizational pro-environmental support is independent from extrinsic values and framing. We have to reject hypothesis 2. However, both

organizational pro-environmental support (γ_2 = .15, *SE* = 0.06, 95% CI[0.02; 0.28], $p < .05$) and extrinsic attributions are significantly related to self-rated PEB over time (γ_2 = .08, *SE* = 0.04, 95% CI[0.01; 0.16], $p < .05$).

Supplemental analyses

Due to the unexpected findings in hypothesis 2, which revealed a positive relationship between extrinsic attributions and the increase in self-rated PEB, we examined whether sociodemographic variables, such as gender or work time, influenced these results. We considered the possibility that individuals with different sociodemographic characteristics, such as work time, might be more influenced by social recognition at work. For example, employees who spend more time at work might place greater importance on social appreciation of green behavior and be more influenced than those who prioritize their private life. However, we found no significant relationship between sociodemographic variables and the results. We additionally tested whether intrinsic attributions (coded with 1) compared to extrinsic attributions (coded with 0) and intrinsic attributions (coded with 1) compared to the norm only group (coded with 0) was significantly related to the increase in PEB. In both models, intrinsic attributions were negatively associated with self-rated PEB (Intrinsic vs. extrinsic: γ_2 = -.12, *SE* = 0.04, 95% CI[-0.20; -0.04], p = .003; Intrinsic vs. information: γ_2 = -.10, *SE* = 0.04, 95% CI[-0.18; -0.01], p = .062). We tested whether this might be due to ceiling effects or imbalanced attention on extrinsic vs intrinsic attributions but these methodological causes can be excluded as we tested both the distributions of all constructs and the time taken on the according questionnaire page and did not find significant differences ($t(940)$ = -.36, 95% CI[-13.62; 9.43], p =.722) or a change in results when

they were controlled (full details available from the author). Thus, although our nuanced hypotheses on extrinsic framings were not supported, our study suggests that extrinsic reasons for normative behavior in the workplace may be effective.

Discussion

Norm-based interventions are an important tool for increasing employee PEB (e.g., Farrow et al., 2017; Jaich et al., 2023) therefore this study examined different ways of framing norm-based messages. While the traditional understanding is that the best approach is to provide intrinsic attributions for the normative behavior (e.g., Ejelöv et al., 2022; Vansteenkiste et al., 2006), organizational contexts provide external motivators which sometimes seem to be successful (Ling & Xu, 2021; Zibarras & Coan, 2015). Therefore, this study aimed to provide a possible explanation for these mixed findings by exploring the alignment of normative attribution with employees' values and organizational contexts. However, our results from a large pre-registered study were surprising.

First, our results showed that intrinsic values are positively related to the increase in self-rated PEB only when a person sees extrinsic reasons for the normative behavior. In other words, when faced with an extrinsically framed message, people who pursue self-development or societal contribution had greater increases in self-rated PEB than those who do not. Drawing on SDT (Deci & Ryan, 2000), intrinsic values direct people to behaviors that are more closely related to psychological need satisfaction whereas extrinsic pursuits are rather common in competitive, pressured, and controlling environments being stressful and leading to destructive behaviors (Kasser & Ryan, 1993, 1996). However, it is interesting that we found positive effects

of intrinsic values only in the group who received extrinsic attributions and not in those who received intrinsic attributions. In other words, when receiving intrinsic attributions, intrinsic values do not increase PEB. An explanation could be that intrinsic attributions for the normative behavior may evoke feelings of guilt for those with intrinsic values. Research shows that behaviors that are not enjoyable but that contribute to the greater good – as it is likely the case with PEB – can be associated with feelings of guilt after refraining from such moral actions (Schwartz, 1970; Van Der Werff et al., 2013; van Zomeren et al., 2012), particularly for those with a strong environmental self-identity (Stets & Carter, 2012; Van Der Werff et al., 2013). Providing morally 'perfect' reasons for why others are engaging in the behavior may have created comparisons with the participants' own 'non-perfect' actions, eliciting feelings of personal guilt and shame, and thereby nullifying their motivation for self-rated PEB.

Second, providing self-concordant attributions to act in an environmentally-friendly way did not lead to greater increases in self-rated PEB than either the non-self-concordant group or the control groups (descriptive norm only and full control). In other words, neither employees striving for intrinsic values and receiving intrinsic attributions nor employees striving for extrinsic values and receiving extrinsic attributions showed higher increases in self-rated PEB than others. A reason can be that behavior is dependent on the individual's importance of the higher-order values involved and on the degree to which this behavior is effortful, connected with negative experiences, or negatively related to other higher-order values (Sheldon & Emmons, 1995; Sheldon & Kasser, 1995). While we can see that the importance of intrinsic attributions for the normative behavior is assessed as being personally important, we cannot ensure that PEB is

not connected with negative experiences. Indeed, previous research reveals that PEB is likely to be assessed as less pleasurable, more time-consuming, or effortful (Steg, 2003) which may negatively influence the behavioral motivation and have a stronger impact than self-concordant attributions.

Interestingly, supplemental analyses showed that providing intrinsic attributions for the normative behavior lead to a significantly lower increase in self-rated PEB than either providing extrinsic attributions or providing only the norm. As the provided normative information was the same in all three groups, intrinsic attributions must therefore be negatively related to employees' motivation to engage in PEB. We framed the attributions according to the guidelines of descriptive norm research, implying that *more and more* people not only manage to act pro-environmentally but because of altruistic reasons. These statements represent the social norm of morally perfect behavior that reflect what is the "right" thing to do. Recent research suggests that highlighting such positive examples can have countervailing effects (Lasarov et al., 2022). For instance, when people take others' behaviors as orientation for their own actions, sustainable social cues can be interpreted as a moral license that liberates people from sustainable behaviors (Kouchaki, 2011; Lasarov et al., 2022). Also, reading that more and more people are becoming 'perfect' citizens may evoke feelings of jealousy because we tend to compare ourselves with others and these statements imply an extreme upward comparison that seem unattainable (Diel et al., 2021; Salovey & Rodin, 1984). As such, they may decrease self-esteem (Lewis, 2021), demotivate (e.g., Diel et al., 2021) and thus, reduce PEB. Another explanation can be that intrinsic statements may make people feel guilty, sad, and desperate as they believe themselves to

have failed morally in comparison to the majority. People with low self-esteem, especially, tend to underestimate their own abilities (Morrison & Morrison, 1978) and see themselves as worse than other people (Wood & Lockwood, 1999). They may feel entitled to being selfish and morally reprehensible resulting in less PEB.

Explanations for extrinsic attributions leading to the highest increase in PEB

Especially interesting was the finding that providing extrinsic reasons for the normative behavior led to the highest increase in self-rated PEB. This finding may be associated with increased information processing - providing both the descriptive norm formulation (more and more people act pro-environmentally friendly) and extrinsic attributions (to receive social recognition) may provide information that is new, compared to traditional intrinsic attributions. This may lead to further reflection on one's own behavior and thus, increase PEB (Ratelle et al., 2017). However, this finding can also result from the extrinsic content itself. Research shows that extrinsic goal-framings have positive effects on learning achievements (Jeno et al., 2020), that people tend to show more volunteer behavior in public than in private settings (Linardi & McConnell, 2008), get addicted from social media likes (Dumas et al., 2017), give higher tips when other people are looking (White et al., 2020), and show more norm-guided behavior in light settings than in dark settings (Zhong et al., 2010). All these extrinsic triggers are important, independently of personal values (Vallerand, 1997).

Interestingly, we found an ambivalence between the low perceived importance of extrinsic attributions and the strong effect they had on increasing self-rated PEB – indicating that people do not admit that extrinsic reasons such as social recognition are central reasons for self-

rated PEB but, based on data, they are. Social desirability, the phenomenon that we claim socially desired traits and deny socially undesired behaviors to place us in an advantageous light can be an explanation for this finding (Grimm, 2010). As common beliefs of societal mutual norms are the necessity to take care of others, being helpful, generous, and altruistic (House, 2018), people would contrast the expected social norms by admitting that instead social recognition is a personal central reason for PEB (Farrow et al., 2017). However, people tend to deny or underestimate the impact of social norms thus, social desirability happens unconsciously, intuitively, and as a psychological heuristic rather than intentionally (e.g., Hao et al., 2015). This may be a reason for why the *actual* importance of extrinsic attributions in increasing self-rated PEB was strong although their *perceived* importance was minimal.

Practical implications

Our results showed that extrinsic attributions for normative behavior, such as receiving increased social recognition for PEB, is related to employees' self-rated PEB. Although people assessed intrinsic attributions as being personally more important, extrinsic attributions led to greater self-rated behavior change. Therefore, when organizations frame messages, both intrinsic and extrinsic attributions are necessary. Intrinsic formulations are important to provide the ostensible explanation of behavior for employees while extrinsic formulations have a stronger influence on behaviors. In addition, and bearing in mind the limitations of self-reported *perceptions* of organizational pro-environmental support, our findings suggests that transparent organizational goals that are clearly communicated in a positive way are necessary for PEB. For instance, companies can place prints or photos in the refectory to remind them about vegetarian

food, or to bring containers for leftovers. Leaders may want to include environmental issues in their jour fix or annual employee review to clearly communicate that they notice and support PEB.

Limitations and future research

As usual, our research is not without limitations and it could be suggested that these limitations caused our counter-intuitive findings; therefore, we must openly discuss these limitations and their potential effects. First, we used self-reported questionnaire data that were collected with a panel provider and participants may differ in their characteristics relative to traditional sampling techniques (Behrend et al., 2011). However, research in applied psychology demonstrates that construct relationships of both sampling strategies are similar (Walter et al., 2019). Also, we aimed to reduce the likelihood of hypothesis guessing and the method bias by randomly displaying the items per page (Podsakoff et al., 2003), by including attention checks, by capturing the predictors and dependent variables at different measurement points, and by confirming measurement invariance thus ensuring consistency. Nevertheless, all our groups, including the control group, exhibited an increase in their behavior when measured twice. This observed increase can be attributed to several factors. One primary factor is response bias, where participants may consciously or unconsciously alter their responses upon repeated measurement, aiming to appear more favorable or in line with perceived expectations. Additionally, participants may become more aware of the behavior in question or the context, leading to increased attention and subsequently altered responses (Tourangeau et al., 2000). Future research may consider investigating the influence of values, messages, and behavior changes using different acquisition

and data collection techniques. The inclusion of real-world PEB data and real-world contextual data would be valuable for validating these findings.

Future research should consider adapting the two-week time frame used in this study. It is possible that intrinsic attributions might take longer than extrinsic attributions to impact PEB. Therefore, a two-week period might not have been sufficient to capture the full impact of intrinsic attributions. While this does not exclude the possibility that intrinsically-based message framings did influence PEB, it suggests that their effects may be more evident over a longer timescale. Additionally, intrinsic attributions might affect a person's baseline or average PEB over time, whereas extrinsic attributions might cause quicker contextual fluctuations in PEB. Future studies should explore varying time spans and consider establishing a baseline measurement before manipulating the groups.

Additionally, one could criticize the PEB items for not all being directly linked to the work context and possibly not matching the manipulation. While we cannot ensure that participants interpreted the two items that did not explicitly include 'work' or 'colleagues' in the work context ("I copy and print double-sided" and "I watch my water consumption"), it is likely that participants perceived all the items to be related to work. This is because 'work' and 'colleagues' were explicitly stated in most of the items ("I pay attention to environmental impact when planning my work travel," "I talk with my colleagues about energy consumption," and "I encourage my colleagues to think about their energy use"), and those items were presented immediately after the questions about their work context, such as position and leader norms. Moreover, we calculated the analyses twice—once with the PEB items that are directly linked to

the manipulation (of which one item also includes the term “work”) and once with the behavioral items that did not have distribution problems—and both showed the same results. Thus, it appears that incorrect interpretation of the items or a mismatch between PEB items and manipulation cannot account for our findings; indeed, framing reasons to act pro-environmentally appears to have a widespread impact on diverse PEBs.

While intrinsic attributions were assessed as being more important than extrinsic attributions to act pro-environmentally, extrinsic attributions lead to the highest increase in self-rated PEB. Future research may want to delve more deeply into this ambivalence. More research is needed to investigate the relationships between value ratings, goal framings, environments, and the effects on behaviors. Given that we act according to higher-order values (Cropanzano et al., 1993; Kruglanski, 2013; Unsworth & McNeill, 2017), the fact that extrinsic attributions lead to the highest increase in self-rated PEB may be an indicator for a common drive that cannot be explained by the assessment of values. Maybe the questionnaire assessments on intrinsic and extrinsic values mirror social desirability and draw on our context whether it is permissible to strive for extrinsic values or not.

Conclusion

This paper examines whether concordance between the attributions for normative behavior, personal values, and organizational pro-environmental support affected changes in self-rated employee PEB over time. Drawing on three pre-studies and a pre-registered experiment, we found that neither self-concordant intrinsic nor self-concordant extrinsic attributions are positively associated with an increase in self-rated PEB. However, extrinsic attributions for the

normative behavior and perceived organizational pro-environmental support are positively related to self-rated PEB. Independently of personal values, employees increase PEB when receiving extrinsic attributions and if employees perceive that their organization supports PEB, they are more likely to engage. Although our findings were not as hypothesized, our studies underline the ways in which extrinsic regulation affects PEB in the workplace and progress organizational action against climate change.

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Table 1

The manipulated statements: Group 3 to 1

Group 3: Norm only	And*	Group 2: Extrinsic attribution	Group 1: Intrinsic attribution
More and more people use energy-saving modes of electronic devices at work (e.g., switching off laptops or power strips).		Social media shows that this conscious behavior leads to more and more likes and recognition.	With this conscious environmentally behaviour, they make a small contribution to the preservation of the environment.
More and more people print double-sided and write as much as possible on one sheet at work.		They often get admired for this environmentally conscious behavior.	With this conscious behaviour, they make a small contribution to reducing deforestation.
More and more people are talking to colleagues about energy consumption and environmentally friendly alternatives.		They are often highly valued for this knowledge, as it is associated with a high level of education and self-reflection.	With this conscious behavior, they motivate people to find alternatives and help reduce CO_2 emissions.

More and more people refrain from long-distance travel at work.	Social recognition for long-distance travel is falling, while it is rising for environmental awareness.	With this conscious behavior, they protect biodiversity and our environment.
More and more people bring their own reusable cup and water bottle to work.	Thereby, they are known for environmental awareness which often leads to admiration.	With this conscious behavior, they contribute to make the world a better place.

Note. *And = Group 1 and 2 received the sentence of group 3 and the respective reason.

Table 2

Means, standard deviations, and correlations

	M	SD	1.	2.	3.	4.	5.	6.	7.
1. Intrinsic values	5.17	0.93							
2. Extrinsic values	3.37	.09	.37**						
3. PEB (T1)	3.98	1.13	.29**	.04					
4. PEB (T2)	4.21	1.19	.26**	.04	.73**				
5. Organizational pro-environmental support	4.74	1.35	.22**	.07**	.31**	.31**			
6. Importance of statements	5.11	1.29	.30**	.04	.43**	.42**	.28**		
7. Age	38.40	10.69	−.10**	−.21**	.44**	.44**	.28**	.02	
8. Gender	0.50	0.50	−.15**	.15**	.50**	.49**	.03	−.13**	.11**

Note. T1 = measurement Time 1. T2 = measurement Time 2. Importance of statements = mean of importance rating of all groups. Gender: Female (0), male (1).*$p < .05$.**$p < .001$.

Table 3

Model fit results for restricting the baseline model

	Model 1 (both latent variables)	Model 2 (indicator specific variables)	Model 3 (fixed intercepts)	Model 4 (fixed intercepts + variances)	Model 5 (LCS)
AIC	58833	56798	56786	57019	57037
BIC	59001	57043	56988	57166	57157
Chi-square (df)	2174 (34)	111 (20)	115 (28)	368 (38)	395 (43)
Df	34	20	28	38	43
RMSEA	.19	.05	.04	.07	.07
CFI	.72	.99	.99	.96	.95
SRMR	.12	.03	.03	.07	.07
Chi-square difference		−2063	4	253	28
Df-difference		−14	8	10	5

Table 4

Model fit and estimated path coefficients for each hypothesis

	Hypothesis 1		Hypothesis 2
	Intrinsic self-concordance	Extrinsic self-concordance	
AIC	81126	81454	119368
BIC	81437	81764	120626
Chi-Square (df)	586 (78)	578 (78)	721 (174)
RMSEA	.06	.06	.04
CFI	.94	.94	.93
TLI	.92	.92	.92
SRMR	.06	.06	.04
R^2	.08***	.08***	.10***
	γ (SE)	γ (SE)	γ (SE)
Intrinsic values	.08 (.06)	.08** (.03)	.06* (.03)
Extrinsic values	.02 (.03)	.01 (.06)	.01 (.07)
Intrinsic reason group	.01 (.25)		−.02 (.04)
Extrinsic reason group		.05 (.09)	.08** (.04)
Norm only group			.05 (.04)
Organizational pro-environmental support			.15** (.06)
Intrinsic values x Intrinsic reason group	−.05 (.25)		
Extrinsic values x Extrinsic reason group		.04 (.15)	.01 (.04)

Extrinsic values x Intrinsic reason group					<.01	(.04)
Extrinsic values x Norm only group					.01	(.04)
Support x Intrinsic reason group					−.00	(.04)
Support x Extrinsic reason group					−.03	(.05)
Support x Norm only group					−.03	(.05)
Extrinsic values x Support x Intrinsic reason group					−.03	(.03)
Extrinsic values x Support x Extrinsic reason group					−.04	(.03)
Extrinsic values x Support x Norm only group					.01	(.03)
Age	.04	(.03)	.04	(.03)	.04	(.03)

Note. Standardized coefficients. R^2 = explained variance of LCS. Support = Organizational pro-environmental support. To reduce complexity, confidence intervals are not listed. One-sided *p*-value. *p < .05.**p < .01.

APPENDIX

Appendix A

Pre-study 1: List of collected PEBs framed in imperative

1. Buy power strips and turn them off in the evening when electronic devices are not in use
2. Take shorter showers (turn off the water while soaping and spend less time under the shower)
3. Buy unpackaged goods (avoid items with too much plastic packaging)
4. Bring your own reusable bag for shopping
5. Take fewer napkins at fast-food restaurants
6. Access bank statements digitally
7. Turn off lights, TV, or computer screens when not needed
8. Introduce more energy-efficient lighting (energy-saving bulbs, rechargeable batteries, etc.)
9. Turn off the water while brushing your teeth
10. Don’t let the water run while washing dishes (e.g., use a washing basin and reuse that water for watering plants)
11. Share food with neighbors, friends, or family before it spoils
12. Air dry hair and clothes instead of using a machine
13. Avoid preheating the oven if precise baking temperature is not required
14. Make shopping lists and avoid spontaneous purchases to prevent buying unnecessary food
15. Buy second-hand

16. Encourage colleagues, friends, and family to behave more sustainably
17. Refuse plastic straws
18. Put a "No advertising" sticker on the mailbox
19. Avoid palm oil products
20. Pick up and dispose of litter in public places
21. Separate waste
22. Switch to a clean, renewable energy provider
23. Don't eat meat
24. Join an environmental protection organization
25. Don’t smoke
26. Share environmental information and contributions on social media and within your community
27. Recycle products instead of throwing them away
28. Buy eco-friendly, fair, and local products
29. Don’t litter
30. Invest in environmental projects
31. Boycott environmentally harmful products (e.g., products that require a lot of petroleum to produce)
32. Give a potted plant instead of a bouquet
33. Donate to a local environmental association
34. Learn about local pollution problems

35. Take care of existing green spaces (e.g., community gardens)
36. Reduce screen time (e.g., laptop, mobile phone, TV, tablet)
37. Donate your own items (e.g., clothing, shoes, books, etc.)
38. Use reusable water bottles and coffee cups

Appendix B

Pilot study 2: Shortened list to a set of 26 attributions

	Behavior and attributions
1	Taking public transportation to work provides time for personal development, listening to podcasts, answering emails, and reading.
2	Buying eco-friendly and fair products helps stop the exploitation of developing countries. [1]
3	Riding a bicycle means fewer cars on the road and thus fewer life-threatening accidents.
4	Undertaking fewer air travels ensures that our grandchildren and great-grandchildren can experience the same flora and fauna as we know it.[1]
5	Planting a wildflower meadow instead of paving the garden provides space for bees and other creatures to survive, contributing to biodiversity conservation.[1] Additionally, it has been shown that people living closer to green spaces are happier (Alcock et al., 2014).
6	Using rainwater for watering plants and preferring showers over baths saves water. This means fewer rivers need to be pumped dry in summer, ensuring the supply of food and medicine can continue[1] (dpa, 2020).

7	Recycling packaging materials like newspapers or ribbons from chocolate bunnies/praline packages as gift wrapping results in unique and original gift packaging. This reduces deforestation[1] and doubles the joy for friends.
8	Buying seasonal and regional products also reduces the CO2 emissions from transporting[1] food, helping to maintain clean air.
9	Our mass consumption of palm oil causes monocultures, reduced biodiversity, and deforestation. By avoiding palm oil, we can counteract this and contribute to nature conservation[1] (World Wildlife Fund, 2024).
10	Shopping unpackaged would save 5,500 tons of packaging waste in the EU by 2023 (Beechener et al., 2020).
11	Turning off lights or the computer, setting the air conditioning efficiently, and other energy-saving behaviors can save us a lot of money, which we can then spend on vacations, restaurants, and good food. [1]
12	Through waste separation and reduced plastic consumption, less plastic ends up in the oceans. This results in nicer beaches and better holiday photos. [1]
13	Social reputation can be enhanced by environmentally conscious behavior. Social media shows that sustainable behavior is getting more likes and recognition. [1]
14	Buying seasonal and regional products supports local farmers and stores, helping to preserve our city's appearance.
15	Not ordering from Amazon but shopping locally and supporting regional stores (instead of chains) helps maintain a beautiful downtown and ensures local businesses survive. A pleasant and attractive cityscape increases personal quality of life and well-being (Evans, 2014).
16	Buying used items on eBay or Willhaben means no new products need to be made, reducing the environmental impact of manufacturing. It also saves a lot of money. [1]

17 Eating less meat and more vegetables makes us feel more energetic and dynamic. Fiber in vegetables helps cleanse the intestines (Slavin, 2013).

18 Fabric softeners coat clothing fibers, making it easier for bacteria to cling. We need more detergent to clean the clothes. Avoiding fabric softeners saves money and resources (CodeCheck, 2024; Umweltbundesamt, 2024b).

19 Selling or giving away furniture, books, and other items on eBay/Willhaben instead of throwing them away means we don't have to worry about disposal (e.g., disassembling the furniture) and saves money. It also makes someone happy. Researchers have shown that giving and doing good positively impacts our well-being (Weinstein & Ryan, 2010).

20 Washing clothes more deliberately and not running a half-empty washing machine means the clothes wear out less, last longer, and look nicer.

21 Turning off the water while soaping in the shower, washing hands, and brushing teeth significantly reduces warm water consumption, saving a lot on electricity/gas annually (Umweltbundesamt, 2024a).

22 Riding a bicycle to work instead of driving keeps you fit and leads to a lean and sporty body.

23 Switching to green energy providers helps promote the development of renewable energy. This keeps our air clean and provides better views on hikes, at home, and on vacation.

24 Using your own coffee-to-go cup often leads to discounts at the café. Additionally, you don't need a nearby trash can when the cup is empty and gain social recognition from people nearby. [1]

25 Organic and Fairtrade products are often more expensive than other products. Being able to afford organic and Fairtrade products leads to high social recognition. [1]

26 By consciously buying from manufacturers that sell fair trade products, we can steer the market ourselves. The market is driven by our increased demand. [1]

Note. [1]Those attributions have been reframed and taken for the third pre-test. The attributions were not combined with the behavior. The highest factor loading of each item is highlighted in bold.

Appendix C

Pre-study 3: Descriptive norm framings and attributions

Intrinsic attributions

1. More and more people are buying environmentally friendly and fair products. This guarantees a living wage for everyone involved.
2. More and more people are buying seasonal and regional products. This reduces CO2 emissions from transporting the products.
3. More and more people are avoiding palm oil products. This contributes to nature conservation and the preservation of biodiversity.
4. More and more people are avoiding buying from online wholesalers. This reduces CO2 emissions and ensures that their grandchildren and great-grandchildren can experience the same plants and wildlife as we know them.
5. More and more people are using energy-saving functions at home (e.g., energy-saving lamps, turning off laptops, setting the air conditioning efficiently, turning off power strips). This saves resources and secures the livelihoods of future generations.
6. More and more people are mindful of their water consumption (using rainwater and dishwater for watering plants, turning off the water while showering, washing hands, and brushing teeth, and preferring showers over baths) to save water. This means fewer rivers need to be pumped dry in summer, ensuring the supply of food and medicine can continue.

7. More and more people are recycling paper, separating waste, and minimizing plastic consumption. This reduces deforestation and waste in the oceans.
8. More and more people are avoiding air travel. This ensures that their grandchildren and great-grandchildren can experience the same plants and wildlife as we know them.

Extrinsic attributions

1. More and more people are buying environmentally friendly and fair products. Social media shows that sustainable behavior is gaining more likes and recognition.
2. More and more people are avoiding palm oil products. This gives them power over the market and forces manufacturers to find alternatives.
3. More and more people are avoiding buying from online wholesalers. Public respect and recognition for online orders are decreasing.
4. More and more people are using energy-saving functions at home (e.g., energy-saving lamps, turning off laptops, setting the air conditioning efficiently). This saves money, which can then be spent on vacations, restaurants, and good food.
5. More and more people are mindful of their water consumption (using rainwater and dishwater for watering plants, turning off the water while showering, washing hands, and brushing teeth, and preferring showers over baths) to save water. This saves a lot of money, which can be used for good restaurants.
6. More and more people are buying regional organic and fair trade products. These products are often more expensive and associated with wealth and prosperity.

7. More and more people are recycling paper, separating waste, and minimizing plastic consumption. This helps preserve our beaches and enables beautiful holiday photos.
8. More and more people are avoiding air travel. Public respect and recognition for flights are decreasing.