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Spillover in Sustainable Consumer Behavior: A Matter of Commitment

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ABSTRACT

Consumers express their commitment to environmental protection by engaging in a variety of environmentally protective behaviors. We thus suggest that strengthening consumers' commitment to environmental protection will *cause* behavioral spillover, which is the joint change in multiple environmentally protective behaviors. This idea differs from other spillover notions that draw on psychological processes that *follow* a change in a specific behavior. By reanalyzing data from a pre-post treatment-control quasi-field experiment with customers of a retail company in which one group was exposed to a multiple-component intervention over the course of 8 months, whereas the other was not, we corroborated a significant commitment gain in the experimental group ($n = 81$) that did not occur in the control group ($n = 152$). This commitment gain manifested in the expected spillover effect that mirrored the Rasch-model-implied likelihood gains in increasingly favorable behavioral expressions of people's commitment to environmental protection. This research complements existing models of behavioral spillover by providing theoretical and empirical arguments that strengthening consumers' commitment to environmental protection can result in spillover. In practical terms, focusing on people's commitment to environmental protection could thus be a promising avenue for directly promoting sustainable lifestyles.

1 | Introduction

If consumers do not engage in more environmental protection and ultimately lead more sustainable lives, the 1.5°C or 2.0°C targets will remain unachievable (Nguyen and Johnson 2020; Nielsen, Clayton, et al. 2021). Such environmental protection can be manifested by a plethora of behaviors related to reducing energy and resource consumption, following living space and equipment requirements, reducing waste production, or choosing different modes of transportation. However, changing people's lifestyles differs from changing well-defined, specific behaviors, which are the traditional targets in consumer psychology and the behavioral sciences (e.g., Geller 2002; Schultz 2014). Undeniably, removing obstacles or adding benefits will change specific behaviors (see, e.g., Brick et al. 2021; Thøgersen and Alfinito 2020). But focusing on specific behaviors can be considered inefficient, as scholars must not only choose their target behaviors with care (see, e.g., Nielsen, Cologna, et al. 2021; Stern 2000) but also arduously assess the effectiveness of each behavior-change method for each specific behavior separately (e.g., Kormos et al. 2021; Schultz 2014).

Alternatively, following the legacy of William James (1918), psychologists can opt for a comprehensive approach that promotes various behaviors simultaneously and will consequently lead to more sustainable consumption patterns. In this tradition, psychologists believe that people are motivated to engage in behavior for *reasons* and to attain *goals*, such as

staying safe and healthy. Our approach is grounded in the principle that the more important a personal reason or goal is, the more likely people will be to engage in behavior that is conducive to the goal (see, e.g., Austin and Vancouver 1996; Kopetz et al. 2012). Accordingly, people's commitment to a goal (e.g., protecting the environment) is reflected in the occurrence probabilities of behavioral expressions of that commitment and verbally expressed opinions in favor of the goal (see, e.g., Kaiser 2021; Kaiser et al. 2010). Any change in people's commitment[1] must thereby affect a multitude of environmentally protective behaviors simultaneously. Such a simultaneous alteration of various behaviors has been named *behavioral spillover* (Thøgersen 1999).

The spillover phenomenon has inspired a large body of research, as it holds promise for mastering the challenge of eliciting more sustainable consumption patterns and for raising people's general propensity to engage in environmentally protective behavior. Grounded in a *causal chain view*, most studies have aimed to identify the one initial behavior change that effectively *spills over* to other behaviors (see, e.g., Juhl et al. 2017; Thøgersen and Crompton 2009; Truelove et al. 2014). Typically, these studies explore moderators and mediators that are expected to foster or hinder spillover. Overall, the results are not compelling and remain rather inconclusive (see Geiger et al. 2021).

The alternative *common source view* of behavioral spillover has yet to attract much research. It conjectures that behavioral spillover is caused by a change in commitment—that is, a change in the common source of environmentally protective behaviors. In this view, an increase in a person's level of commitment to environmental protection implies that the whole array of environmentally protective behaviors that are conducive to the environmental-protection goal all become more likely (see Henn et al. 2020). So far, the causal claim that is implied by this idea has been corroborated only with correlational (between-person) evidence by Henn et al. (2020).

In the present study, we extend this line of research and provide (within-person) causal evidence. With data from a pre-post treatment–control design in a quasi-experimental field trial, we tested whether an instigated change in people's commitment would spill over into people's manifestations of their commitment to protecting the environment. In the next three sections, we expand on our rationale by first clarifying the roles of *reasons* and *goals* as causes of behavior. In particular, we argue that prioritizing environmental protection as a focal reason for engaging in certain behaviors (rather than providing external reasons) is an effective way to promote change in multiple environmentally protective behaviors simultaneously. In the second section, we elaborate on the behavioral manifestations of commitment as a mechanistic cause of a domain of behavior: behavior that is suitable for protecting the environment. In the third section, we review the current evidence on behavioral spillover. We then outline the methods we used to empirically test our common source view of behavioral spillover. In the Results section, we first corroborate the intervention group's expected increase in commitment. We then demonstrate that this increase was manifested in a pattern across multiple environmentally protective behaviors that closely matched the theoretically anticipated pattern. In the Discussion, we address the limitations of our study (e.g., the ad hoc nature of our commitment measure) and propose avenues for future research. Moreover, we elaborate on the theoretical and practical implications of our findings and on spillover's potential for promoting sustainable lifestyles.

1.1 | Changing Behavior With Reasons

In the following, we discuss two prevailing approaches that use reasons to foster environmentally protective behavior. The first approach relies on "external" reasons in the form of supplementary benefits (i.e., in addition to the "internal" reason, protecting the environment). The other approach focuses on the environmental-protection reason itself.

1.1.1 | Providing External Reasons

Appeals to environmental protection as a reason for why people should engage in certain behaviors, for example, by providing information about environmental consequences or utilizing visual or auditory reminders (i.e., prompts), have proven to be relatively ineffective in changing behavior (e.g., Osbaldiston and Schott 2012). Thus, instead of fostering people's commitment to environmental protection, researchers often provide other reasons unrelated to protecting the environment for why people should change their behavior (e.g., Bain et al. 2016; Brick et al. 2021; Edinger-Schons et al. 2018).

Such reasons are, conceptually speaking, incentives or disincentives. For example, people are lured into environmental protection by way of financial (e.g., Kaiser et al. 2020), moral (e.g., Gatersleben et al. 2019), or social incentives (e.g., Goldstein et al. 2008; Kleinschafer et al. 2021). By contrast, environmentally harmful behavior is prevented by financial, moral, or social disincentives (for overviews, see Osbaldiston and Schott 2012; Steg and Vlek 2009). Because the person ultimately strives to attain a reward or avoid a penalty, the environmentally protective behavior is implemented for reasons (e.g., achieving financial gains or avoiding financial losses) that are external to environmental protection (see, e.g., Kaiser et al. 2020).

Individuals who change their behavior to avoid a penalty or get a reward (e.g., to win a prize in a bike-to-work challenge) will expectedly not take up *other* environmentally protective behaviors (e.g., commuting by bike) that go beyond the targeted one(s). Regarding the goal of more sustainable lifestyles, this type of behavior change thus seems rather inefficient. We are not saying that such a behavior-specific approach is never sensible. Behavior-specific approaches can be useful, for instance, when targeted behaviors come with a high environmental impact (e.g., purchasing an electric car instead of a gasoline-powered one, improving home insulation, avoiding air travel). However, because they are limited to one or a few targeted behaviors, behavior-specific approaches expectedly do not lead to more comprehensive behavior change and do not affect the individual's commitment to environmental protection (see, e.g., Kaiser et al. 2020).

1.1.2 | Fostering Environmental Protection as the Reason for Behavior

We argue that targeting people's environmental protection as the reason for their behavior, that is, their commitment to the environmental protection goal, is a more efficient way to change behavior. As psychologists know, people choose their actions for *some* reason, that is, they engage in a behavior to pursue a goal (e.g., Hommel 2022; Kaiser 2021). However, attaining distal goals, such as protecting the environment, usually requires not just single isolated actions but *persistent* and *convergent* goal striving. To protect the environment, a person must engage in a multitude of behaviors, such as washing laundry in an energy-efficient way, expressing support for environmental protection, avoiding air travel, changing to a plant-based diet, and voting for representatives with a known environmental protection record, to name a few (see, e.g., Ivanova et al. 2020).

As people can, in principle, choose from a plethora of behavioral manifestations of their commitment, they must eventually make a choice. Previous research has provided ample evidence that people do not choose behaviors at random. Instead, they make predictable, rational choices when they strive to achieve their personal environmental protection goals. Specifically, people invest only as little effort, time, money, or inconvenience as is necessary to actualize their personal commitment to protecting the environment (Kaiser et al. 2010; see also Juhl et al. 2017). Thus, people typically favor convenient, socially accepted, and undemanding behaviors—behaviors with comparatively fewer costs—over inconvenient, proscribed, and demanding, high-cost behaviors (see, e.g., Kaiser and Lange 2021; Kaiser and Wilson 2004).

Accordingly, various studies have demonstrated that people with a stronger commitment to environmental protection are willing to incur more behavioral costs to engage in environmental protection: for example, longer waiting times (Kaiser and Lange 2021; Taube et al. 2018), higher prices (Kaiser et al. 2020), and more effort (Taube et al. 2021; Taube and Vetter 2019). An intervention that strengthens the importance of environmental protection as a reason—and thereby enhances people's commitment to environmental protection—can thus affect multiple behaviors with which people actualize their commitment. In the next section, we explore the link between people's commitment and the behavioral manifestations of this commitment.

1.2 | Behavioral Manifestations of Commitment

Because commitment is expected to *cause* its behavioral expressions, these manifestations by which people actualize their environmental protection goal must be functionally linked to people's commitment to environmental protection (see Kaiser and Wilson, in press). Figure 1 schematically depicts the relationship between people's commitment and its manifest expressions: Items 1 to n stand for manifestations of people's commitment to environmental protection. Next to corporal behavior aimed at environmental protection, commitment can also manifest in verbal expressions of opinions and in self-reports of previous behaviors related to environmental protection.

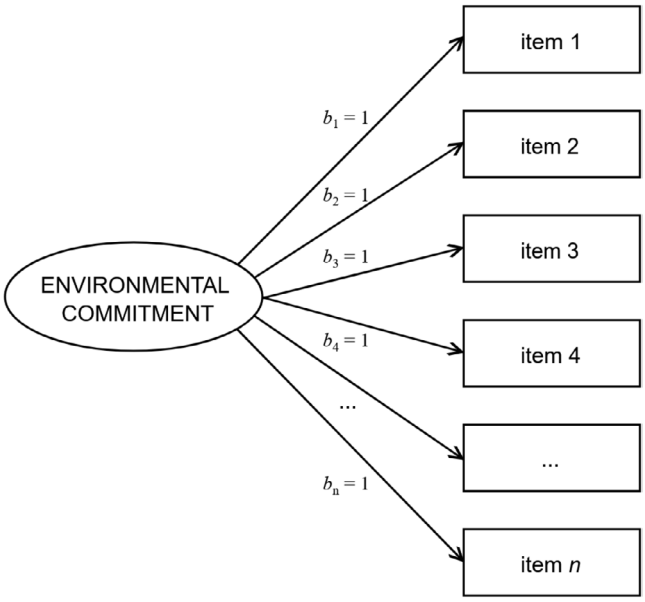

FIGURE 1 | Schematic depiction of the functional relationship between people's environmental commitment and its manifestations.

The Campbell paradigm is a theory that captures the functional relationship depicted in Figure 1 (Kaiser et al. 2010). This theory was named in reference to the contribution made by Donald Campbell. Campbell (1963) suggested that the strength of people's commitment can be seen in the behavioral costs people incur when they actualize their commitment. The Campbell paradigm can be mathematically formalized by the Rasch model (Rasch 1980/1960; for a more recent account, see, e.g., Wilson 2023). The paradigm states that the probability of manifesting a specific behavior (e.g., commuting by bicycle) depends on the difference between a person's commitment level and the behavioral cost of the manifestation (Kaiser et al. 2010). The higher an individual's commitment to protecting the environment, the more likely they will be to manifest protective behaviors and the more costs they will incur by doing so.

The degree of a person's environmental commitment is correspondingly reflected in their (verbal or nonverbal) behavioral manifestations of this commitment. In Figure 1, the loadings of the manifestations (b_{1-n}) are all 1.0, which speaks of the fact that all the manifestations are equally suited to reveal people's commitment. In other words, the manifestations can be used interchangeably, and any arbitrary selection of them reflects people's commitment to protecting the environment equally well (see Kaiser et al. 2018; Rasch 1977). As another consequence, successful increases in people's commitment to protecting the environment—by way of interventions—unavoidably affect the probabilities of all the manifestations of commitment simultaneously and systematically. Note, however, that equal loadings do not imply equal probabilities of manifestations, as these probabilities are a function of the costs of a manifestation and of a person's commitment level (see Equation 1).

$$ln\frac{p_{ki}}{(1-p_{ki})} = \theta_k - \delta_i \quad (1)$$

According to the Rasch model depicted in Equation (1), the probability of the recurrence of a specific behavioral manifestation of commitment is depicted as the natural logarithm (*ln*) of the ratio of the probability (p_{ki}) that person k will engage in the specific behavior i relative to the counter-probability that person k will not engage in behavior i. This recurrence probability that a specific manifestation i will be observed is in turn a function of the arithmetic difference between person k's commitment level (θ_k) and the behavioral costs (δ_i) involved in the behavioral manifestation i. Thus, a person's commitment must countervail the costs of a specific behavioral manifestation (i.e., θ_k must exceed the value of δ_i) for the person to be likely (i.e., $p_{ki} > 0.50$) to implement the behavior (Kaiser et al. 2010).

The Rasch model represents a restrictive model that allows the functional relationship depicted in Figure 1 to be tested *statistically* (see Kaiser and Wilson 2019). If successful, this test involves tracing back all the manifestations to a single source and explaining all the manifestations with two causes: People's personal commitment to environmental protection and the costs of a specific behavioral manifestation of commitment (see, e.g., Kaiser et al. 2010). In this process, a Rasch model test assigns numbers to people with respect to their personal commitment and to manifestations representing their specific costs.

From the Campbell paradigm, we can derive that a program or intervention that successfully strengthens people's commitment to environmental protection increases the probabilities of all behaviors through which people express their commitment. In other words, with any commitment change, a domain of behavior (i.e., all behaviors suitable for protecting the environment) will change systematically and predictably. Next, we appraise all currently available evidence on behavioral spillover in the literature on environmental protection and sustainable consumption.

1.3 | Evidence of Spillover

Behavioral spillover is believed to occur in two general ways. In the first, the *causal chain view*, behaviors change *consecutively* as a behavior-to-behavior alteration (see, e.g., Carrico et al. 2018; Dolan and Galizzi 2015; Kuhn et al. 2021). In the second, the *common source view*, behaviors change *simultaneously* due to a change in the common "motivational" origin of these behaviors (see, e.g., Henn et al. 2020).

1.3.1 | The Causal Chain View

In the causal chain view, an initial change in a specific behavior initiates a psychological process. In this process, (a) a newly acquired behavior (e.g., refraining from single-use plastic bags) is presumed to draw attention to a broader problem (e.g., overconsumption). This new awareness subsequently makes people find even more ways to reduce their consumption, for example, by avoiding excessively packaged products, reusing plastic bags, refraining from car use, or saving water (see, e.g., Poortinga et al. 2013). Alternatively, (b) the newly acquired behavior is conjectured to instill a need for consistency, leading people to align their actions with the new protective behavior (see, e.g., Truelove et al. 2016).

Both notions are based on the assumption that a newly adopted environmentally protective behavior typically uncovers inconsistencies between this new behavior and people's other, still environmentally harmful behaviors (Poortinga et al. 2013; Thøgersen 2004). The tension created by this inconsistency motivates people to act more consistently by avoiding harmful behavior so that all their behaviors become better aligned with environmental protection (Thøgersen and Crompton 2009).

However, two recent meta-analyses found no conclusive support for such a causal chain view (see Geiger et al. 2021; Maki et al. 2019). Notably, 20 out of 55 studies analyzed by Geiger et al. (2021) used external, personal-gain-oriented reasons to elicit spillover behavior effects. In line with our expectation that external reasons (via incentives) are unlikely to affect people's commitment to environmental protection and thus other environmentally protective behaviors, Geiger et al. (2021) found that personal-gain-oriented interventions are unlikely to lead to behavioral spillover.

Notably, both meta-analyses indicated that behavioral spillover seems to occur when interventions provide a rationale for or foster people's commitment to protecting the environment or when people already hold relatively strong such commitments (Geiger et al. 2021; Maki et al. 2019). Expectedly, the common source view offers a promising perspective for an alternative explanation of spillover (see also Truelove et al. 2014).

1.3.2 | The Common Source View

The common source view states that spillover occurs because the strength of people's commitment to environmental protection directly affects the ways in which people manifest their commitment (see Figure 1; see also Henn et al. 2020). Any change in commitment (i.e., the common source of environmentally protective behavior) is thus automatically accompanied by a change in the recurrence probabilities of people's behavioral manifestations of their commitment. This view originates in the Campbell paradigm. The paradigm claims that the probabilities of the manifestations of a person's commitment to environmental protection are a function of two compensatory forces: A person's commitment to environmental protection and the costs of a behavioral manifestation. The larger the difference between a person's commitment and the costs of a behavioral manifestation of commitment, the more likely (or unlikely, if the difference is negative) the person will be to implement the specific behavioral manifestation of commitment (Kaiser 2021; for empirical evidence, see, e.g., Kaiser et al. 2020; Kaiser and Lange 2021; Taube et al. 2018; Taube and Vetter 2019).

Spillover can thus be expected when there is an increase in people's commitment to environmental protection, as this increase enhances the person's capacity to countervail behavioral costs for any of the behavioral manifestations of commitment (Henn et al. 2020). As Henn et al. (2020) demonstrated, spillover resulting from an increase in commitment to environmental protection does not affect all behavioral expressions to an equal extent. More specifically, behavioral spillover follows a well-defined logistic pattern: An increase in a population's commitment to environmental protection leads to relatively smaller gains in the

recurrence probabilities at the extremes (i.e., for low-cost and high-cost manifestations of commitment). By contrast, the increase leads to more pronounced gains in the recurrence probabilities of behavioral manifestations with mid-range behavioral costs. In other words, if a person's commitment to environmental protection increases, they will adopt more environmentally protective behaviors, and this effect will be more obvious for medium-cost behaviors (because most people's commitment levels fall in the mid-range) than for high-cost or low-cost behaviors.

In their research, Henn et al. (2020) corroborated this common source explanation with correlational (between-person) evidence. However, with such cross-sectional data, they were not able to empirically substantiate causation: namely, that an *increase* in commitment causes spillover. For this phenomenon to occur, spillover would need to be traced back to an intervention that effectively induces commitment to environmental protection. With this study, we aimed to substantiate *within-person* change in people's commitment to environmental protection that subsequently translates into an expected logistic pattern of behavioral spillover.

1.4 | Research Objectives

Our goal was to corroborate Henn et al.'s (2020) common-source explanation of behavioral spillover. We used data from a study that originally aimed to test the causal chain explanation of spillover (see Elf et al. 2019). In contrast to other causal chain studies, however, Elf et al. (2019) did not target one specific behavior but aimed their intervention at various aspects of sustainable lifestyles within a naturalistic setting, among them an array of environmentally protective behaviors. In their study, they assessed various behavioral manifestations of commitment to environmental protection, thereby allowing us to construct an impromptu measure of people's commitment. In addition to the behaviors that were addressed in the intervention, we also incorporated manifestations of commitment into our impromptu measure that were not directly addressed, including verbal expressions of opinions about environmental protection (see Measures).

Because Elf et al. (2019) study involved a pre-post treatment-control design, we could control for baseline differences and attribute potential commitment gains to the intervention to which the experimental group was exposed (see Shadish et al. 2002). The control group was a no-treatment control group with matched socioeconomic background characteristics. Nevertheless, due to the nonrandom allocation to groups, there was still a chance that potential effects could be caused by some unknown confounding influences.

The 8-month intervention was a comprehensive program aimed at learning about, reflecting on, and engaging in more sustainable lifestyles. It consisted of eight components, which we describe in more detail in the Materials and Methods section. We expected that the multicomponent intervention would strengthen participants' commitment to environmental protection and, in turn, spill over into the various behavioral manifestations of people's commitment. We thus expected that the experimental group's commitment to environmental protection would increase after the intervention, relative to baseline and to the control group. Moreover, we also expected that this increase in commitment would lead to a logistic pattern of behavioral spillover. Thus, we predicted that the increase in commitment would lead to the greatest observable increase in the recurrence probabilities of the manifestations with mid-range costs, as most participants' commitment levels (and changes) fell within this range. By contrast, the increase in the recurrence probabilities at the extremes (i.e., for high-cost and low-cost behaviors) were expected to be less pronounced. Because we did not test a causal chain explanation for spillover, we did not distinguish between direct and indirect behavior changes (cf. Carrico 2021). Instead, we expected a simultaneous increase in the recurrence probabilities of all behavioral manifestations. Figure 2 summarizes our research process.

Beyond the theoretical advances in understanding the causes of behavioral spillover, this research provides practically relevant knowledge for policy-makers on how to design effective behavior-change campaigns in the public and for sustainability management in companies regarding how to promote more sustainable practices among their consumers or employees. Interventions and communication efforts that omit the distal goal of environmental protection might fall short of realizing their full behavior-change potential. Moreover, if commitment levels are known (e.g., from a certain target group), our model of spillover allows for specific predictions about which behavior changes are likely to manifest, and these could correspondingly be flanked by additional measures to maximize outcome success.

2 | Materials and Methods

For this secondary analysis, we employed data from a field experiment that was funded and administered by a large retailer (see Elf et al. 2019). The measures that we developed with items from the data set and the strategy used to test for spillover differ from the original study by Elf et al. (2019).

2.1 | Participants

Participants consisted of two groups: the experimental group, recruited on a voluntary basis from among the customers of a large retail company, and the control group, recruited by a market research company. The control group was matched to the experimental group's income and housing location as a proxy for sociodemographic similarity. The original sample consisted of 251 participants from which we excluded 18 (all from the experimental group) from further analysis due to missing data, resulting in a sample size of $N = 233$ for our analyses. Participants who were eliminated did not differ in their baseline levels of commitment to environmental protection ($M = -1.02$, $SD = 0.89$) from the remaining participants in the experimental group ($M = -0.93$, $SD = 0.73$), Welch's $t(22.39) = -0.39$, $p = 0.695$, $d = 0.12$, 95% CI [−0.39, 0.63], or from those in the control group ($M = -0.73$, $SD = 1.25$), Welch's $t(25.79) = -1.25$, $p = 0.223$, $d = 0.24$, 95% CI [−0.25, 0.73].

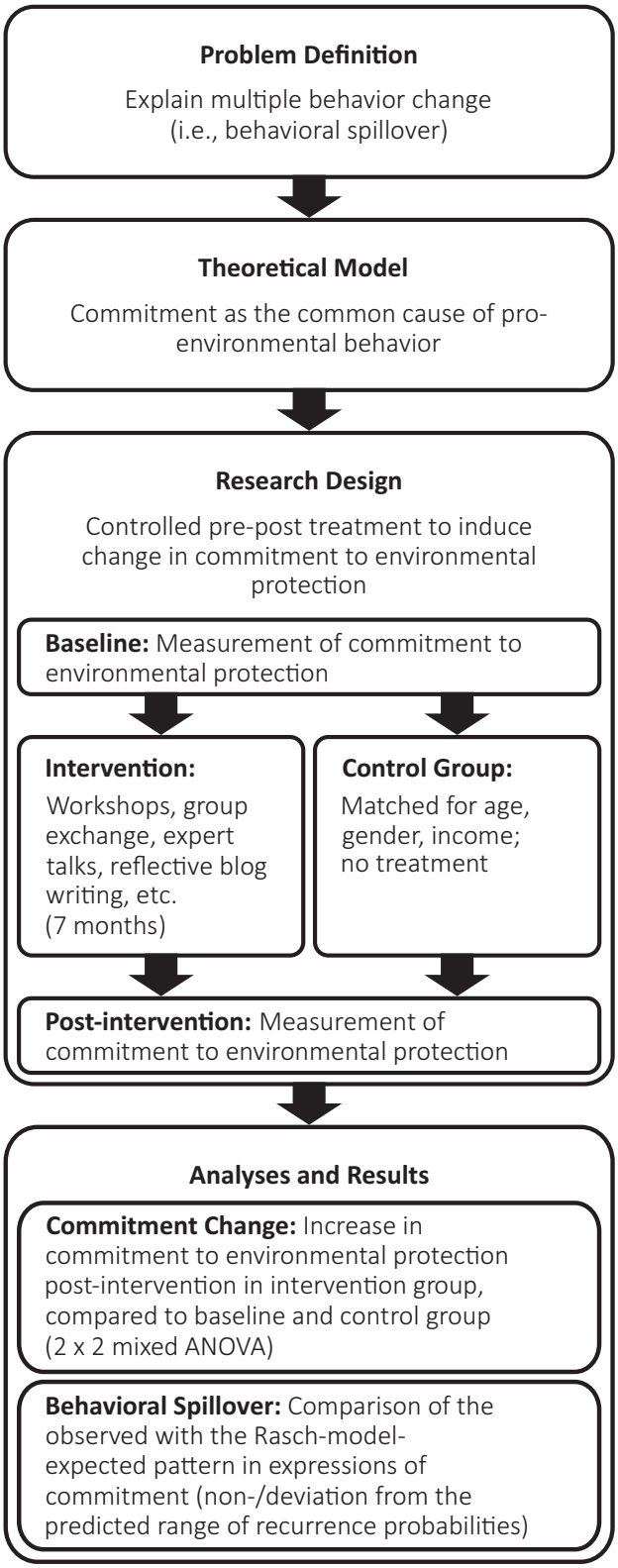

FIGURE 2 | Flow chart depicting the research process.

Of the 233 participants with complete baseline and follow-up data, 178 (76.4%) were women, and 55 (23.6%) were men. Eighty-one were in the experimental group and 152 in the control group. Control and experimental groups were stratified into age groups of similar proportions, with 30% of participants younger than 35 years, 45% between 35 and 44, and 25% older than 44. The two groups showed small differences in gender, with slightly more women in the control group (84.0%) compared with the experimental group (72.4%), $\chi^2(1) = 3.31$, $p = 0.069$, $\varphi^2 = 0.012$. Because recruitment was external and the control group was matched by a market research company, detailed sociodemographic data were not available. Whereas the samples were matched, and thus, we assume that the groups had similar distributions of age and income, we could not statistically confirm their similarity. Minor group differences (e.g., the gender difference we observed) may still exist but are unlikely to be substantial.

2.2 | Experimental Setup

Customers of a large retail company were offered the opportunity to participate in an 8-month program that was promoted by the retail company as "Live LAGOM" where *lagom* referred to a Swedish lifestyle trend that focuses on moderation, balance, and sustainability as a desirable approach to different areas of life. This program served as the intervention. Participation in the field experiment was voluntary, and participants self-selected into the experimental group. Whereas the customer program was labeled a behavior-change project by the authors of the original research (see Elf et al. 2019), the design of and communication around the intervention addressed sustainability and environmental protection as broader concepts and as desirable goals, indicating that the intervention was in fact designed to bring about a deep-seated change in commitment rather than only specific behavior changes.

The intervention consisted of eight components that targeted low- to high-impact behaviors and, more broadly, people's commitment to environmental protection. The intervention components were (a) a financial incentive in the form of a £300 (approximately €350) voucher redeemable for sustainability-related household products (e.g., water- or energy-saving devices) from the retailer, (b) a monthly newsletter on sustainability, (c) a closed Facebook group to encourage interaction among participants (e.g., about experiences with behavior change or thoughts about sustainability), (d) an opportunity to engage in reflective blog writing, and (e) home audits by a local contact person. The intervention additionally involved (f) three regional social networking events, (g) an online Q&A session with experts on energy efficiency, and (h) a workshop on food self-sufficiency involving information on how to reduce food waste, combined with a food-waste challenge (for more details, see Elf et al. 2019). Ethical approval for the intervention had been obtained from the University of Surrey Ethics Committee by the authors of the original study.

2.3 | Measures

The data contained self-reports of environmentally protective behaviors and of rebound in energy and water consumption, subjective ascriptions of responsibility, and expressions of values/guiding principles, perceived behavioral control, and the reasonability of a sustainable lifestyle (for more details, see Elf et al. 2019). Most of the items used in the original research were not included in our secondary analysis; instead,

we selected items that we thought reflected commitment, with the goal of compiling an impromptu measure of people's commitment to environmental protection. As Urban and Kaiser (2022) demonstrated, such impromptu measures can be scalable as Rasch scales if they cover a wide range of behavioral costs.

For our impromptu measure, two independent experts, familiar with the Campbell paradigm, had to rate each available item on whether it represented an expression of commitment or not (0 = no, 1 = probably yes, 2 = yes). The interrater agreement was reasonable with a *Fleiss' K* of $K = 0.77$ (Landis and Koch 1977). Based on these ratings, 29 items were selected. These expressions of commitment encompassed self-reports of behavior, such as the frequency of purchasing second-hand or recycled products (Item #3 in Table A1), and expressions of values and identity, such as whether environmental protection is regarded as a guiding principle in one's life (Item #22) or whether being environmentally conscious has become a fundamental part of one's identity (Item #13). For a complete and verbatim list of expressions of commitment, their cost estimates, and their fit statistics, see Table A1.

All 29 expressions were calibrated as a Rasch scale using the dichotomous Rasch model (for details on the Rasch model, see Wilson 2023; Wright and Masters 1982). To this end, we dichotomized the rather heterogeneous response options of the 29 items into either the presence or absence of commitment. Converting graded responses into a binary format has become established practice when implementing the Campbell paradigm (see, e.g., Kaiser and Wilson 2004, 2019). The practice is in line with Kaiser and Lange's (2021) finding that graded responses often reflect personal idiosyncrasies and, thus, measurement error and not valid differences in people's commitment (for support of the practice, see also DeCoster et al. 2009). Table S1 provides the recoding details. The negatively formulated items ($i = 4$), which express a lack of commitment to environmental protection, were reverse-scored. The recoding had the expected beneficial effect and suppressed measurement error (for detailed information, see Tables S2–S5). The scale calibration was conducted with the `eRm` package in R.

Commitment to environmental protection was assessed in logits. Logits stand for the natural logarithm of the ratio of the probability of manifesting commitment to the probability of not manifesting commitment (see Equation 1). Higher positive logits reflect a more pronounced commitment to environmental protection. The measure's ability to distinguish between individuals in terms of their commitment was reasonable (person separation reliability: $rel = 0.85$).

The fit values of the 29 manifestations of commitment that reflect the relative discrepancy between the Rasch model's prediction and people's actual responses were acceptable throughout, with mean square (MS) values (weighted by the item variance) between 0.75 and 1.29 (see Wright et al. 1994; for more details on item-specific fit statistics, see Table A1). The Rasch model failed to properly anticipate the response patterns (reflected in a poor person fit statistic: i.e., $t \geq 1.96$) of only five (2.2%) of the 233 participants. Overall, these statistics confirmed satisfactory scale characteristics for our impromptu commitment measure.

To devise a benchmark for *identifying spillover*, it was necessary to conduct a more detailed examination. According to the Campbell paradigm, people's commitment to environmental protection is equated with the recurrence probabilities of the various behavioral manifestations of commitment (see Kaiser 2021). This connection can be seen in the following logistic relationship:

$$p(x_{ki} = 1 \mid \theta_k, \delta_i) = \frac{\exp(\theta_k - \delta_i)}{(1 + \exp(\theta_k - \delta_i))} \quad (2)$$

In Equation (2) (the logistic version of the Rasch model in Equation (1)), the recurrence probability (p) of k (a person or a group) manifesting commitment in i ($x_{ki} = 1$) is conditioned on k's commitment (θ_k) and the costs related to that particular manifestation of commitment i (δ_i). *Exp* refers to the exponential function with Euler's constant e (2.718) as its base, which is raised to the power of the difference between k's commitment (θ_k) and the costs related to the particular manifestation of commitment i (δ_i).

Any gain in people's commitment to environmental protection—after the experimental intervention—is supposed to mimic the Rasch model's expectations. Accordingly, behavioral spillover resulting from a commitment gain can be identified in the pattern of the recurrence probabilities of the behavioral manifestations of commitment at follow-up. This pattern is supposed to follow the logistic function described by the Rasch model. Stated more simply, gains in commitment are supposed to translate into a specific increase in the recurrence probabilities of the manifestations of commitment. As people's commitment to environmental protection increases, they manifest their commitment by incurring more costs. When this increase shows up in all behavioral manifestations simultaneously (e.g., self-reported behaviors as well as expressions of identity and support for environmental protection), and in line with the Rasch model's expectations, the pattern suggests spillover.

3 | Results

The results are reported in two sections. In the first section, we tested the intervention's effectiveness for strengthening people's commitment to environmental protection, which is the precondition for a subsequent spillover test. In the second section, we then explored the recurrence probabilities of the 29 manifestations of commitment and examined whether the commitment gains translated into the anticipated logistic function described by the Rasch model. The data analysis script is available on https://osf.io/eukth/files/osfstorage/68da35378e6d698cca432cd7. The data were not made publicly accessible due to restrictions imposed by the funder of this research. However, the data are available upon request.

3.1 | Testing for Within-Person Change in Commitment

Using a two-way mixed ANOVA that employed group (experimental vs. control) as the between-subjects factor and assessment

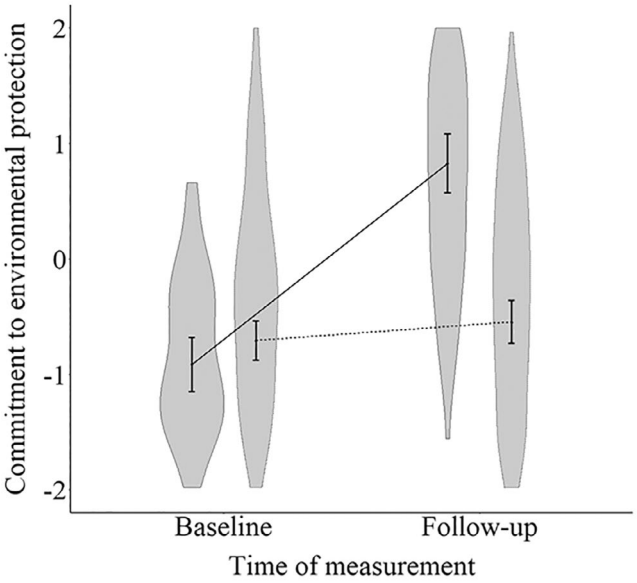

FIGURE 3 | Commitment to environmental protection in the experimental and control groups at baseline and follow-up. Time points connected with a solid line represent the experimental group. Time points connected with a dotted line represent the control group. Error bars around the four dots indicate 95% confidence intervals. Grey-shaded orbits represent the distribution (vertical expansion) and the density (horizontal expansion) of the respective data.

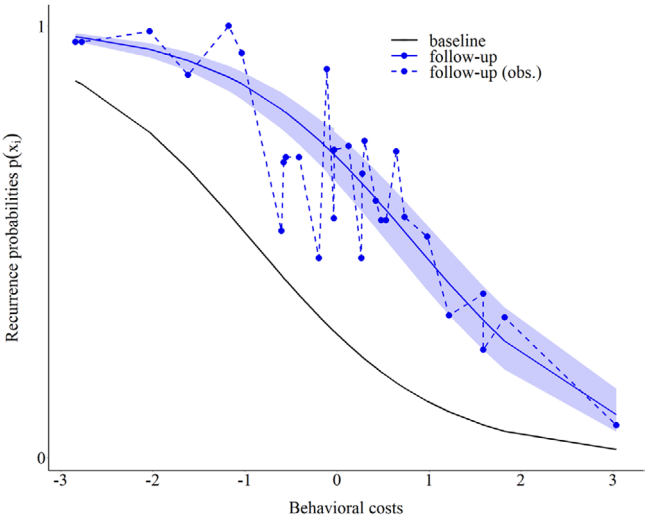

FIGURE 4 | Recurrence probabilities of people's manifestations of commitment to environmental protection in the experimental group. This figure displays data only from the experimental group. The recurrence probabilities of the manifestations of commitment are plotted against the manifestations of behavioral costs. The probabilities at baseline are depicted as a solid black line. The Rasch-model-implied expected probabilities (due to the commitment increase shown in Figure 3) of the commitment manifestations at follow-up are depicted as a solid blue line. Probabilities and costs reflect the Rasch-model-implied logistic relationship (see Equation 2). The follow-up trajectory is presented within 99% confidence intervals (represented by the blue shaded area). The trajectory of the actual recurrence probabilities of the 29 manifestations of commitment at follow-up (blue dots) are depicted as a dashed blue line. (Costs are estimated with all available data from all participants before and after the intervention).

time (baseline vs. follow-up) as the within-subjects factor, we found a significant interaction between group and assessment time (see Figure 3), $F(1, 230) = 152.46$, $p < 0.001$, $\eta_p^2 = 0.40$, 95% CI [0.32, 1.00]. Most of the effect could be attributed to a significant increase in commitment in the experimental group ranging from $M = -0.92$ (SD = 0.71) at baseline to $M = 0.83$ (SD = 1.03) at follow-up, $t(80) = 16.18$, $p < 0.001$, $d_{robust} = 1.80$, 95% CI [1.57, 2.08]. Although the control group also differed between baseline ($M = -0.71$, SD = 1.22) and follow-up ($M = -0.55$, SD = 1.24), the effect was small and almost negligible in comparison, $t(150) = 2.20$, $p = 0.03$, $d_{robust} = 0.18$, 95% CI [0.01, 0.36].

Because of the slight overrepresentation of women in the experimental group, we also tested the model with gender as an additional between-subjects factor. There was no main effect of gender, $F(1, 227) = 0.15$, $p = 0.70$, but it showed a small interaction with assessment time, $F(1, 227) = 4.80$, $p = 0.03$, $\eta_p^2 = 0.02$, 95% CI [0.00, 1.00]. However, the interaction between group and assessment time remained significant and large even after gender was controlled for, $F(1, 227) = 82.16$, $p < 0.001$, $\eta_p^2 = 0.27$, 95% CI [0.19, 1.00].

3.2 | Testing for Spillover

Spillover can be recognized in more pronounced probability gains in the mid-range of behavioral costs and in smaller such gains at the extremes (i.e., with low-cost and high-cost commitment manifestations—where commitment changes can manifest with only a few people). This pattern occurs because of a lack of elasticity due to large shares of the people already manifesting low-cost expressions of commitment to environmental protection and large shares of people who will never be committed enough to incur the costs of high-cost manifestations of commitment.

In our analysis, we compared the Rasch-model-implied (i.e., the expected) trajectory of recurrence probabilities—accompanying the change identified in the experimental group's commitment level—with the actual recurrence probabilities of the 29 manifestations of commitment to environmental protection at follow-up. Thus, the more similar the two trajectories were, the clearer we considered the evidence that the behavioral spillover that occurred reflected a change in people's commitment to environmental protection.

The recurrence probabilities of the 29 commitment manifestations for the experimental group at baseline are depicted as a solid black line in Figure 4. The Rasch-model-implied *expected* recurrence probabilities for the experimental group at follow-up are depicted as a solid blue line. The latter trajectory is presented within a 99% confidence interval (the blue shaded area). The *actual* recurrence probabilities of the 29 manifestations of commitment for the experimental group at follow-up are depicted as blue dots connected with a dashed blue line.

We recognize that, in Figure 4, the actual recurrence probabilities of the commitment manifestations consistently increased after the intervention. They are also quite systematically scattered around the Rasch-model-implied expectations. It thus

seems safe to conclude that the gain in the experimental group's commitment to environmental protection translates into the anticipated spillover effect that mimics the Rasch model's expectations regarding the recurrence probabilities of the 29 manifestations of commitment at follow-up.

Spillover as a result of an increase in commitment can be seen in the fact that 15 manifestations of commitment employed by the experimental group fell into the confidence interval around the Rasch model's expectations (see Figure 4). Still, the recurrence probabilities of 14 (44.8%) of the 29 manifestations of commitment fell outside the anticipated confidence interval, thereby significantly departing from the Rasch model's expectations.

Six manifestations of commitment to environmental protection became disproportionately more likely. They can be found above the confidence interval in Figure 4. Disproportional gain was found for two behavioral manifestations for which participants could redeem their shopping vouchers[2] (i.e., installing energy-efficient devices or LED bulbs: Items #18 and #25 in Table A1) and for two expressions of perceived behavioral control (Items #8 and #12 in Table A1). Moreover, we found a marginally disproportionate gain for two expressions of the reasonableness of sustainable lifestyles (Items #27 and #24 in Table A1).

Despite plausible explanations for non-model-conforming changes in some manifestations of commitment (e.g., the surplus effectiveness of financial incentives/rewards; see Kaiser et al. 2020), we recognize that each indicator of commitment is fallible, as it can be biased by coincidental influences (even more so with relatively small sample sizes). Expectedly, all 14 departures from the Rasch-model-implied expectations seem to concern commitment manifestations that stretch from the middle to the low end of the cost continuum (see Figure 4). One might thus speculate that this area is more vulnerable to disturbances and biases than the high end of the cost continuum.

Of the various manifestations of commitment to environmental protection, eight became disproportionately less likely (and fell below the confidence interval in Figure 4). Less gain than expected under the model was found for five behavioral manifestations: repairing and recycling things (instead of replacing them), lowering the thermostat, switching from driving to biking or walking for short journeys, switching off appliances, and avoiding food waste (Items #14, #17, #19, #23, and #26 respectively, in Table A1). These findings might speak of a comparatively lower plasticity of behavioral self-reports in general compared with other manifestations of commitment. They could also speak of some changes in the boundary conditions between baseline (assessed in late fall) and the follow-up assessment, which took place in summer—when, for example, adjusting the thermostats was probably not an issue at all.

Furthermore, three value statements regarding guiding principles in life increased less than expected (Items #20, #21, and #22 in Table A1). Nevertheless, in the experimental group, they increased significantly between baseline and follow-up, whereas no such increase occurred in the control group (see Figure A1). In other words, these underachieving items might indicate that the efficacy of the intervention is overstated in terms of commitment change. However, they do not speak of the intervention's inefficacy. Along with the rather balanced departure from the Rasch-model-implied expectations with a similar number of over- and underachieving manifestations of commitment (i.e., six vs. eight) after the intervention (see Figure 4), our findings by and large support the proposed common source explanation of spillover.

4 | Discussion

With our secondary analysis of data from a previously conducted field experiment, we demonstrated spillover behavioral effects after an intervention that targeted people's commitment to protecting the environment. With an extensive quasi-experimental, long-term real-life intervention, we substantiated a common source explanation of within-person behavioral spillover (Henn et al. 2020). By strengthening consumers' commitment to environmental protection, multiple behavioral manifestations of commitment effectively changed simultaneously. Specifically, we found that the actual recurrence probabilities of people's manifestations of commitment largely corresponded with the Rasch-model-implied expectations depicted in Equation (2). That is, the correspondence between consumers' commitment levels and the behavioral costs associated with specific manifestations of this commitment explained the recurrence probabilities of the latter.

4.1 | Theoretical Implications

Earlier findings had already corroborated that commitment to environmental protection seems to translate into people's corresponding manifestations of commitment. Yet, these earlier findings were derived from between-person and, thus, correlational data (Henn et al. 2020). The *within*-person quasi-experimental data presented in Figure 4 now provide, for the first time, more conclusive evidence that commitment is the cause of behavioral spillover. Specifically, the data reveal that an increase in commitment to environmental protection manifests in a pattern of behavioral spillover that is theoretically anticipated by the Campbell paradigm.

The Campbell paradigm explains behavior as a function of people's latent commitment along with the behavioral costs of the manifest expressions of commitment (see Equation 1). The implied assumption is that a change in the latent commitment variable affects all manifestations *equally*. Accordingly, the Campbell paradigm predicts the extent to which expressions of commitment exhibit spillover. The critical relevance of the costs of manifestations can be seen in the logistic nature of this prediction. Figure 4 confirms that the empirical data by and large followed the predicted logistic pattern—thus, the occurrence probability for each manifestation increased in the theoretically anticipated manner. Our findings support the common source view of behavioral spillover (Henn et al. 2020; see also Brügger and Höchli 2019) in which a change in the importance of an underlying common reason—protecting the environment in our case—leads to mutual change in various manifestations of people's commitment to environmental protection. Notably, however, our findings do not challenge a causal chain view of

spillover (in which an initial change in behavior causes a sequence of further behavior changes; see, e.g., Maki et al. 2019; Truelove et al. 2014). A change in commitment has also been considered in the causal chain tradition (see, e.g., Isbanner et al. 2025; Lacasse 2016; Thøgersen and Crompton 2009). Instead, we offer a complementary explanation that can inspire future research to look further into the processes at work when spillover arises. Rather than an initial behavior change, it may be an internal change in people's commitment that causes behavioral spillover.

Our common source explanation of spillover resides in the Campbell paradigm, a parsimonious understanding of environmentally protective behavior (see, e.g., Kaiser 2021; Kaiser et al. 2010). Moreover, it provides the foundation for a potentially efficient way to change a multitude of behaviors simultaneously. Our results imply that spillover does not depend on any characteristics of the targeted behaviors, such as originating from the same domain or requiring the same resources (see, e.g., Margetts and Kashima 2017; Poortinga et al. 2013; see Figure A1 for evidence that changes are not limited to certain domains but affect all expressions of commitment). Yet, behavioral costs play an important role when a specific behavioral effect is to be predicted (see Figure 4; see also, e.g., Truelove et al. 2014).

4.2 | Practical Implications

To become more efficient, rather than changing well-defined, specific acts of environmentally protective consumption in isolation (see, e.g., Nielsen, Cologna, et al. 2021; Stern 2000), consumer psychologists are supposed to learn how to employ more comprehensive approaches that change multiple consumer behaviors simultaneously and, thus, lead to more sustainable consumption patterns. We argue that comprehensive approaches that aim to change behavior patterns depend on changing people's commitment to environmental protection. With our research, we demonstrated that consumers' commitment to environmental protection can be actively promoted (see Figure 3) and can thereby lead to more sustainable consumption patterns (see Figure 4).

Notably, changing people's commitment was extremely taxing, time-consuming, and complex, and it required the extensive support of a large corporation (see also Elf et al. 2021). As such, the commitment intervention consisted of eight components and stretched across a period of 8 months. This complexity did not allow us to isolate the exact features that caused the change in commitment. Some components of the intervention may have promoted only specific behaviors (e.g., the vouchers for energy-efficient devices; see Items #6 and #18), whereas more reflective intervention components (e.g., blog-writing, group exchange) may have indeed promoted commitment.

For the purpose of this research, the plain fact that our intervention worked was critical. In the long run, however, it will be necessary to understand the efficacy of such interventions and develop more parsimonious ones that can, ideally, even be used in public campaigns and consumer communications. Thus, learning more about the features that make a commitment intervention effective and more efficient is of practical relevance when sustainable behavioral patterns and less consumptive lifestyles are concerned (see, e.g., Brick et al. 2024; Elhoushy and Jang 2023; Lim et al. 2023).

People's propensity to strive to protect the environment is reflected in the ways in which people manifest their commitment to environmental protection (see, e.g., Kaiser et al. 2020; Taube et al. 2018; Taube and Vetter 2019). As a personal propensity, people's commitment is stable over time and does not change much spontaneously (see, e.g., Bauske et al. 2022; Otto and Kaiser 2014). Moreover, a boost in the importance of people's commitment to environmental protection does not require any monitoring or further support from some secondary benefits. Consequently, if change in more than a single behavior is of interest, then public campaigns and consumer communications should focus on fostering commitment to environmental protection rather than on providing secondary benefits for specific behavior.

4.3 | Limitations

Our research comes with several limitations. First, the idea to use Elf et al.'s (2019) data to test Henn et al.'s (2020) common source explanation for behavioral spillover was inspired by a visual inspection of previously published findings by one of the authors. Thus, we already had an awareness of the data and hence our hypothesis was not truly prognostic.

Second, the nonrandom allocation to the experimental and control groups carries the risk of alternative explanations for the findings presented in Figure 3. The problem was addressed by matching the control and experimental groups. However, this approach works only for the potential confounds that were addressed by matching (i.e., gender, age, income) and were subsequently controlled for statistically. A number of potentially relevant variables had not been assessed in this study, such as other sociodemographic characteristics (e.g., educational degree, type of occupation) or other psychological traits relevant to intervention responsiveness (e.g., readiness for change). Such unrecognized differences in the compositions of the two groups at baseline could not be accounted for statistically and might therefore have contributed to our findings.

Our sample had a rather strong gender bias (i.e., 76% of participants were female). The higher self-selection of women into the *Live Lagom* participant group might be an example of women's tendency to be more concerned about protecting the environment (e.g., Vicente-Molina et al. 2018; see Avery et al. 2025, for potential explanations). The overrepresentation of women was balanced across the experimental and control groups (with only marginal differences between groups). Statistically, we controlled for gender and found no main effect, meaning that women and men were equally environmentally committed in our sample. However, we found a small interaction with assessment time, suggesting that the intervention might have been somewhat more effective for women than for men. Accordingly, the effect of the intervention on a change in commitment to environmental protection might

be less pronounced in a sample with comparatively more men. Furthermore, collaborating with a retail company and a market research institute that collected the data imposed the important limitation on our research that not all available sociodemographic data were accessible for the research team. Consequently, we were neither able to statistically confirm the success of the matching and had to rely on the commercial pollster's professional integrity, nor were we able to otherwise control these sociodemographic variables.

A potential threat to internal validity lies in the fact that the control group was recruited from a different population (the general public rather than the customers of the retailer). However, the likelihood that many control group participants were also customers of this retail company is probably rather high due to the retailer's popularity.

For the impromptu commitment measure, we validated each individual's manifest response pattern against their theoretically anticipated response pattern (for other examples of this approach, see Bauske et al. 2022; Urban and Kaiser 2022). Such an approach would not have been possible had we used an operational measurement approach with a predefined fixed set of manifestations. Yet, our measurement approach was informed by a specific theory (i.e., the Campbell paradigm), which captured the functional relationship between people's environmental commitment and its corresponding manifestations (see Kaiser and Wilson in press; Wilson 2023). Considering that Elf et al.'s (2019) work provided an extremely limited selection of commitment manifestations, we believe that the manifest responses exhibited some sound overlap with the theoretical expectations that originated from the Campbell paradigm, which can be seen in our impromptu commitment measure's satisfactory scale characteristics.

Finally, although we suggested that Figure 4 speaks of behavioral spillover that occurred after an increase in people's commitment, the presented evidence is not perfectly conclusive, as 14 of 29 manifestations fell outside the 99% confidence interval. The first issue to address here is our decision to use a 99% confidence interval in this case rather than the more common 95% interval. Any single manifestation is sensitive to all sorts of influences and is, thus, fallible, particularly with data that had been collected over an extensive time period and that originated from relatively small samples. To safeguard against an overly harsh benchmark, we decided to use the slightly larger 99% confidence interval. The second issue we would like to address is the rather balanced numbers of over- and underachieving manifestations of commitment (i.e., six vs. eight, respectively). These fairly equal numbers speak at least qualitatively for random fluctuation around the anticipated logistic function. Nevertheless, despite the encouraging results, we believe that a replication with manifestations that are less vulnerable to disturbances and biases would be sensible.

4.4 | Future Research

Reflecting on the findings and limitations, we urge other researchers to consolidate the empirical foundation of the common source explanation of behavioral spillover. This consolidation can be attained by improving the measurement of people's commitment to environmental protection before and after the intervention (e.g., by using independent measures, see Kaiser et al. 2018) and by thoroughly controlling (or excluding) the intervention elements aimed at behavior-specific costs (e.g., vouchers for sustainable products) rather than commitment.

The common source explanation of observed behavioral spillover could additionally be strengthened with field studies that investigate actual behavior and employ refined quasi-experimental research designs that allow for a more reliable causal inference (Shadish et al. 2002; Schafer and Kang 2008).

Eventually, we also have to better understand the features that make commitment interventions effective, and we should learn how to more efficiently raise people's commitment to environmental protection. The monetary costs, the ethical issues, and the boundary conditions that come with commitment interventions must be identified as well, as some people might not be responsive or may oppose such efforts, especially individuals who perceive such efforts to be intrusive or overly normative. Ultimately, spillover effects should be validated not only with behavior but by their impact (i.e., reductions in CO_2 emissions and amounts of resources or energy consumed).

Lastly, future research should engage more systematically, both theoretically and empirically, with the two prevailing views on behavioral spillover: As a causal chain triggered by initial behavior change and as a shift in the common source of a domain of behaviors. Whereas some scholars view the initial behavior change as definitional for spillover, the empirical evidence and the theoretical reflections about possible causes of multiple behavior changes point to the value of reopening the conceptual debate and critically re-examining the foundational assumptions underlying current definitions.

4.5 | Conclusion

We provide evidence for the common source explanation of behavioral spillover, that is, for the fact that people take action for reasons and strive to attain goals with their behaviors (see, e.g., Kaiser 2021). Thus, it seems safe to conclude that people actualize their commitment to the environmental protection goal in their consumption patterns and in their more or less sustainable lifestyles. They save electricity, endorse climate policies, adopt low-meat diets, abstain from car ownership, and engage in various other environmentally protective practices. In order to cause behavioral spillover and a simultaneous change in a plethora of behaviors and even lifestyles, we thus suggest strengthening people's commitment to protecting the environment. As such, people's commitment to protecting the environment represents a critical lever for change toward more sustainable lifestyles.

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Conflicts of Interest

The IKEA Sustainability Department commissioned the intervention program from Hubbub UK (a charity working on a range of pro-environmental and social projects with links to behavior change: for further information, see www.hubbub.org.uk). IKEA, however, was not involved in the scientific exploration presented in this article. The views and opinions expressed in this article are those of the authors and do not necessarily reflect the views and opinions of IKEA.

Data Availability Statement

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

Endnotes

[1] The conceptually correct term used in the literature for people's commitment to environmental protection (Kaiser 2021)—people's propensity to act in an environmentally protective way—is *environmental attitude* (Kaiser et al. 2010). As environmental attitude often also refers to opinions (e.g., "I find protecting the environment to be important"), we chose commitment as the conceptual label to avoid ambiguity.

[2] The voucher could be redeemed for a wide range of products. In principle, the products that were eligible had the potential to support participants' engagement in sustainable lifestyles and were not limited to LEDs or energy-efficient devices.

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Supporting Information

Additional supporting information can be found online in the Supporting Information section. **TABLE S1:** Item Wording and Coding Scheme for the Two Measures for Commitment to Environmental Protection. **TABLE S2:** Psychometric Feature of Two Measures of Commitment to Environmental Protection. **TABLE S3:** Fit Statistics for the 29 Expressions of Commitment to Environmental Protection When Calibrated With the Partial Credit Rasch Model Ordered as in Table A1. **TABLE S4:** Cost Estimate for the 29 Expressions of Commitment to Environmental Protection When Calibrated With the Partial Credit Rasch Model Ordered as in Table A1. **TABLE S5:** Descriptive Statistics, Reliabilities, and Bivariate Correlations for the Two Estimates of Commitment to Environmental Protection Per Person.

Appendix A

TABLE A1 | The 29 expressions of commitment to environmental protection ordered by estimated costs.

	Expressions of commitment	δ	MS_w	MS_u	t_w	t_u
1.	How often do you hire, share, or borrow products instead of buying them?	3.04 (0.21)	0.97	**1.86**	−0.13	1.92
2.	How often do you choose fairly traded, eco-labeled, and independently certified foods, clothing, and so forth?	1.82 (0.14)	0.89	0.73	−1.21	−1.39
3.	How often do you buy second-hand or recycled products?	1.59 (0.13)	1.14	1.35	1.66	1.80
4.	*It's too expensive for me to choose environmentally friendly products.*	1.59 (0.13)	0.87	0.76	−1.73	−1.38
5.	Because I would feel guilty if I didn't.[a]	1.22 (0.12)	1.04	0.97	0.55	−0.13
6.	Approximately how many water-saving devices (e.g., water-saving shower head, tap inserts, shower timer) do you have?	0.98 (0.12)	1.07	1.02	1.14	0.18
7.	*I find it hard to change my habits at home to be more environmentally friendly.*	0.73 (0.11)	0.83	0.77	**−3.14**	**−2.18**
8.	*I don't believe my behavior and everyday lifestyle contribute to climate change.*	0.64 (0.11)	0.84	0.69	**−3.09**	**−3.20**
9.	To what extent is it easy to live a sustainable lifestyle?	0.53 (0.11)	0.97	0.96	−0.56	−0.37
10.	To what extent is it affordable to live a sustainable lifestyle?	0.48 (0.11)	1.09	1.08	1.67	0.81
11.	I'm aware of what I need to know and do to contribute to reducing pollution and protecting the environment.	0.42 (0.11)	0.99	0.96	−0.12	−0.36
12.	*It takes too much effort to do things that are environmentally friendly.*	0.30 (0.11)	0.75	0.67	**−5.43**	**−4.19**
13.	Because being environmentally conscious has become a fundamental part of who I am.[a]	0.28 (0.11)	0.82	0.71	**−3.95**	**−3.67**
14.	How often do you maintain, repair, and/or "upcycle" things, in other words give new life to unwanted items instead of replacing them (e.g., furniture, electrical items)?	0.27 (0.11)	1.02	1.14	0.34	1.56
15.	I'm confident I'd know how to get the necessary information if I wanted to live more sustainably.	0.13 (0.11)	1.04	1.10	0.85	1.24
16.	How often do you use product labeling to help you choose the most energy- and water-efficient products?	−0.03 (0.11)	0.95	0.89	−1.01	−1.43
17.	What temperature do you usually set your thermostat to when you are home?	−0.03 (0.12)	1.29	**1.41**	**4.84**	**4.22**
18.	Approximately how many energy-saving devices (other than LEDs, e.g., battery recharger, extension cords with power switches, plug timers) do you use?	−0.11 (0.10)	1.08	1.11	1.71	1.42
19.	How often do you walk or ride a bike instead of driving a car for short journeys?	−0.20 (0.10)	1.26	**1.44**	**5.34**	**5.34**
20.	Guiding principle in YOUR life: preventing pollution.	−0.41 (0.10)	0.84	0.75	**−3.87**	**−3.74**
21.	Guiding principle in YOUR life: respecting the earth.	−0.56 (0.10)	0.88	0.86	**−2.76**	**−2.07**
22.	Guiding principle in YOUR life: Protecting the environment.	−0.58 (0.10)	0.89	0.92	**−2.46**	−1.07
23.	How often do you switch off appliances and not leave them on standby?	−0.61 (0.10)	1.16	1.28	**3.41**	**3.58**
24.	Because helping the environment while saving money and time is a sensible thing to do.	−1.04 (0.11)	0.88	0.81	**−2.74**	**−2.49**
25.	Approximately how many LEDs do you have in use in your home?	−1.18 (0.11)	1.16	1.17	**3.24**	1.88
26.	How often do you avoid food waste, for example, by planning meals ahead, measuring the right portions, using containers to prolong the life of food, or cooking with leftovers?	−1.62 (0.11)	1.02	1.04	0.41	0.34
27.	To what extent is it desirable to live a sustainable lifestyle?	−2.04 (0.12)	0.82	0.73	**−3.01**	**−2.05**
28.	How often do you switch off lights in rooms that aren't being used?	−2.77 (0.15)	0.93	1.04	−0.74	0.24
29.	How often do you use reusable shopping bags?	−2.84 (0.15)	0.97	1.04	−0.33	0.27

Note: Items in italics indicate negatively formulated expressions; they were recoded and should be read as "I do not ..." Cost estimates (δ) are expressed in logits. Mean square (MS) and t values—unweighted ($_u$) and weighted ($_w$) by the item variance—reflect the relative discrepancy between the Rasch model's predictions and the observed data and were, thus, used to assess item fit (see, e.g., Wright and Masters 1982). Bold figures highlight either statistically significant t values ($p < 0.05$) or MS values that did not fall within an acceptable range of fit for typical survey items ($0.60 \leq MS \leq 1.40$; see Wright et al. 1994). A value of $MS > 1.20$ corresponds to an excess of more than 20% variation in the model's prediction compared with what was in the data. Note that negative t values represent "overfit." In other words, our measurement model of commitment to environmental protection corresponded too closely to the data from a formal point of view. As such, negative t values do not refute the Campbell paradigm but rather do the contrary. Items were originally presented in British English.

[a]The item stem was "Why would you be interested in participating in a project, such as Live LAGOM, that enables you to help the environment, save money, save time, and improve your home life?" for the experimental group and "Why would you be interested in participating in a project that potentially enables you to help the environment, save money, save time, and improve your home life?" for the control group.

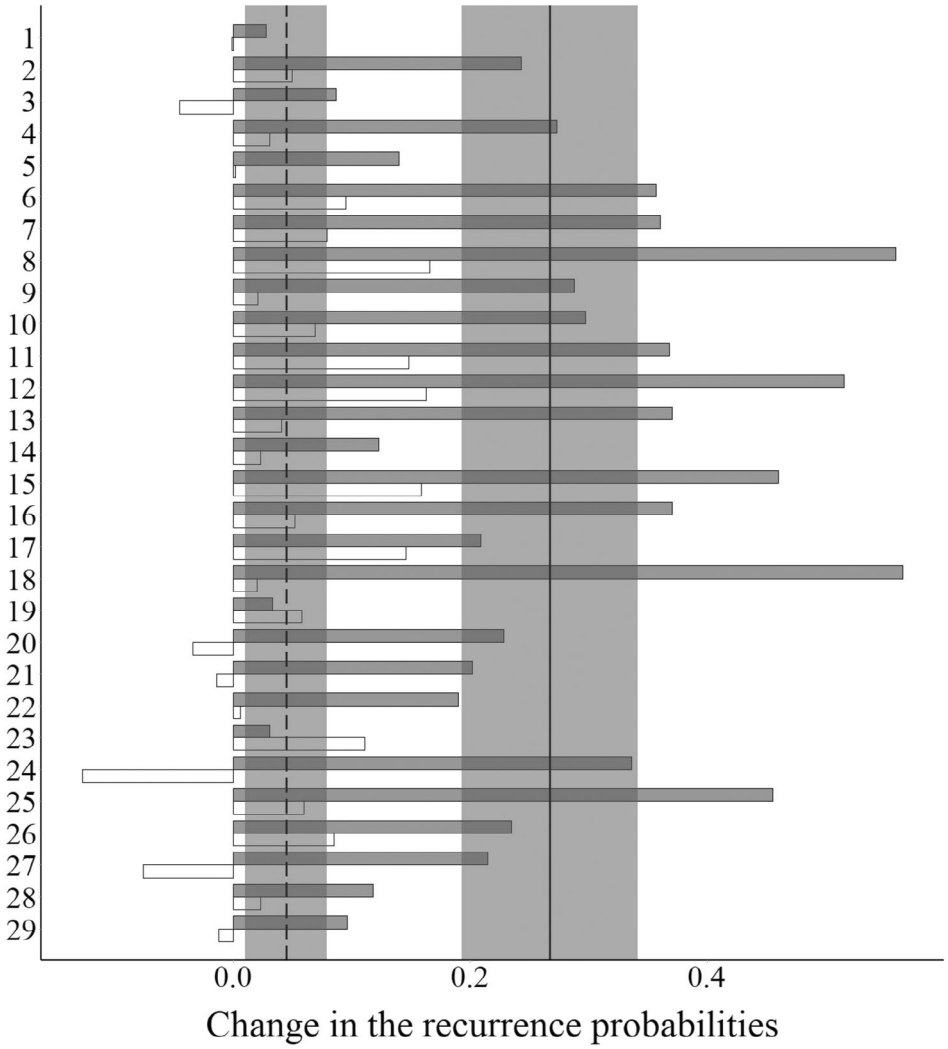

FIGURE A1 | Changes in the recurrence probabilities of 29 manifestations of commitment to environmental protection from baseline to follow-up for the experimental and control groups. The experimental group is represented by the dark grey horizontal bars, and the control group by the white horizontal bars. The solid vertical line depicts the average descriptive increase in the experimental group within its 99% confidence interval (light-grey shaded vertical area). The dashed vertical line depicts the average increase in the control group within its 99% confidence interval (light-grey shaded vertical area). The order of items from top to bottom reflects decreasing behavioral costs. Item numbers correspond to the ones in Table A1.

Biographies

Laura Henn is Associate Professor of Sustainable Behavior and Management at the Department for Business, Economics and Social Sciences at the University of Hohenheim, Germany. She had obtained her PhD in environmental psychology from the Otto von Guericke University Magdeburg, Germany, and thereafter worked as a postdoctoral researcher at the University of Kassel, Germany. Her research interests focus on individual sustainable behavior and sufficiency lifestyles, measurement of environmental attitude, attitude-behavior-relationships, and behavioral spillover.

Florian G. Kaiser is Professor of Personality and Social Psychology at the Otto-von-Guericke University Magdeburg, Germany. At the Swiss Federal Institute of Technology in Zürich, Switzerland, he was assistant professor. At Eindhoven University of Technology, The Netherlands, he was associate professor. His research interests include attitude theory, attitude–behavior consistency, the Campbell Paradigm, evidence-based psychological policy support, large-scale attitude change, and behavior management. Topics of interest primarily are: environment protection, environmental education for sustainable development, environmental psychology. Dr. Kaiser has published more than 100 articles in refereed journals, and he was Co-Chief Editor of the Journal of Environmental Psychology.

Maximilian Adler is a PhD candidate in Florian Kaiser's lab at Otto-von-Guericke University (OVGU). He conducts research on environmental behavior such as sustainable consumption and prosocial behavior. He has a particular interest in measurement using the Campbell Paradigm, crosscultural comparisons and mixed-methods methodology combining behavioral self-reports and behavior tasks.

Patrick Elf is an *Associate Professor—Sustainable Business* at the Centre for Enterprise, Environment and Development Research (CEEDR) at Middlesex University and Co-Investigator at the ESRC funded Centre for the Understanding of Sustainable Prosperity (CUSP) at the University of Surrey. Patrick's research focuses on investigating avenues for organisational change, sustainable business models as well as the mechanisms facilitating behaviour change approaches towards the adoption of more sustainable lifestyles. He has a particular interest in sustainable and transformative consumption, the circular economy and questions of post-growth and degrowth.

Birgitta Gatersleben is Professor of Environmental Psychology and Director of the Environmental Psychology Research Group (EPRG) at the University of Surrey. Her research focuses on sustainable living and engagement with nature. She has published well over a 100 papers and chapters on these topics. Birgitta has led many major research programs and is Surrey lead of ACCESS, a 5-year multimillion pound knowledge exchange program to support the use and value of environmental social science in policy and practice. Her work is interdisciplinary and applied.