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Beyond one size fits all? An experimental study of the effects of stage-specific interventions to promote ecological online food shopping

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Abstract

Encouraging people to consume sustainably is more important than ever to tackle climate change. In the area of nutrition, we focused on understanding how social norm inspired treatments can effectively be applied to promote sustainable purchasing without restricting choice. Many intervention studies in this area have applied ‘one size fits all’-measures, ignoring the target group’s context and psycho-social preconditions. To examine the effectiveness of tailored interventions, we tested the impact on purchasing decisions of four treatments. The treatments were developed based on the four stages of behavioural change that conceptualise behavioural change as a transition through a sequence of stages: predecision, preaction, action, and postaction. In an online experiment ($N = 855$), these treatments (*shopping assistant*, *success story*, *commitment*, and *feedback*) were integrated into a true-to-the-original online food shop and socio-psychological constructs were collected using a downstream questionnaire. The results of a regression analysis showed that there are differences in the effectiveness of the treatments on participants’ purchasing decisions. The feedback treatment turned out to be a particularly effective measure for encouraging large numbers of people at different stages of behavioural change to select greener products. In line with theory, the impact of several socio-psychological variables designed to encourage more eco-friendly purchases increased from stage to stage. The results may motivate online food shop providers to create customer experiences that promote eco-friendly consumption. At the same time, it should also encourage other researchers working in this field to develop effective measures that support the achievement of sustainability goals.

1 | INTRODUCTION

Reducing resource consumption is only possible if we manage to motivate as many people as possible to consume in an environmentally friendly way. In western cultures, where the almost unlimited availability

of goods fuels the desire to buy and consume, this is far from easy. Although environmental friendliness is important to many people (Globescan, 2020; Vermeir et al., 2020), only a small proportion are willing to make changes in their daily lives. The aim of this research is to find out which interventions can help people to change their purchasing

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behaviour. Like mobility and housing, food consumption is also an area that requires attention in terms of reducing environmental impacts (Dubois et al., 2019; Geiger et al., 2018; Tukker & Jansen, 2006), which is why we focused on consumers' purchasing decisions.

Driven by the COVID-19 pandemic, online shopping has increased significantly (Ecommerce Europe, 2021; Eurostat, 2021) and is expected to increase in the future (UPS, 2021). Therefore, digital interventions that facilitate eco-friendly online shopping are required. In online applications (e.g., apps, digital platforms), it is easier to create comparisons with other users (e.g., via competitions, leader boards, testimonials) and it can steer users' behaviours, due to effects such as social influence and connectedness (Chou, 2015). However, there is little clear evidence that systematically using such socially motivating elements changes behaviour in terms of sustainable consumption (Johnson et al., 2017; Whittaker et al., 2021). In addition, it must be clarified under which circumstances (e.g., pre-conditions of the target group) such social influence interventions are effective. To overcome the current 'one size fits all' approach in research on social influence, theoretical models in environmental psychology that characterise specific stages of the behavioural change process may be a promising approach (Bamberg, 2013a). However, there have been only few empirical studies to date that have attempted to develop theory-based interventions for specific stages of behaviour change (Bamberg et al., 2015). To investigate whether tailored interventions can make online shoppers' choices eco-friendlier, we conducted an experiment with different treatments.

2 | THEORETICAL BACKGROUND

2.1 | Stage-specific influence of digital social norm interventions

To develop the digital interventions to promote greener purchasing behaviours, we built on existing research on social influences and gamification in the context of sustainability (Berger, 2019). Numerous psychological studies have shown that interventions that consider social norms and social comparisons have great potential (Aarts & Dijksterhuis, 2003; Allcott, 2011; Cialdini et al., 1990; Farrow et al., 2017; Huitink et al., 2020; Rhodes et al., 2020; Sparkman et al., 2021; Terrier & Marfaing, 2015; Thomas & Sharp, 2013). However, these studies primarily took place in a non-digital environment (e.g., using posters and flyers) and used descriptive and injunctive social norm information (Cialdini et al., 1990) as references in communication media. Based on the assumption that 'one size fits all', many studies did not address a specific target group or context, leading to large inconsistencies in the effectiveness of interventions (Silvia & Palma-Oliveir, 2010). In addition, undesirable side-effects have also been observed, for example, subgroups that have already performed the desired behaviour fell back into negative behaviour patterns, also known as the boomerang effect (Schultz et al., 2007).

These shortcomings in effectiveness can be explained by the fact that the effectiveness of social influence interventions may differ

depending on the context (Hardeman et al., 2017) and the psychological pre-conditions of the target group, such as personal norms, subjectively perceived social norms and not least an individual's stage in the behavioural change process (Bamberg, 2013a; Ohnmacht et al., 2017). Therefore, tailoring interventions to the motivational states of target groups could promote more sustainable behaviour (Bamberg et al., 2015; Brug et al., 1996; Hardisty et al., 2010; Nguyen & Johnson, 2020; Oyebode et al., 2021; Wienert & Kuhlmann, 2015). Our main research question was: Do tailored interventions work better, that is, do the interventions' effectiveness depend on a consumer's stage of behavioural change?

2.2 | Stage model of behavioural change

Consumers' daily purchasing decisions are influenced by a variety of internal and external factors (Pilgrimiené et al., 2020), conscious and unconscious ones (Wansink, 2010), which makes the issue of eco-friendly consumption both very complex and multi-layered (Phipps et al., 2013). In addition, eco-friendly purchasing decisions require a certain degree of knowledge and awareness (Hartmann et al., 2021) and are often difficult, which is revealed by misconceptions in terms of the environmental performance of food products (Lazzarini et al., 2018). Undesirable side effects (e.g., negative spillover effect; Sorrell et al., 2020) can hinder eco-friendly behaviour as well.

Therefore, a lot of motivation, knowledge and skills are needed to resist everyday temptations and to develop new purchasing patterns that will persist over time. In our study, we referred to the stage model of self-regulated behavioural change [SSBC] (2013b) for our theoretical framework. This model assumes that behavioural change is a deliberate, dynamic process that consists of several stages and transition points. The SSBC has been successfully applied in a few environmental intervention studies (Bamberg, 2013b; Klöckner, 2017). The framework allows the population to be segmented, defining four stages that an individual goes through to exhibit a new behaviour such as eco-friendlier purchasing decisions. Depending on where a person is in the change process, the stages are referred to as follows: *Predecisional*, *preactional*, *actional*, and *postactional*. How the four stages were considered during treatment development is discussed in the next chapter. To move from one stage to the next, the model defines three so-called transition points, which are marked by different types of intention. The transition from one stage to the next is dependent on various socio-psychological factors, such as social and personal norms, environmental concerns, values and attitudes, and perceived behavioural control (Aertsens et al., 2009; Scalco et al., 2017). Taking a stage model as our framework, we defined our research question as follows: Does the consumption of eco-friendly products increase if consumers encounter stage-specific interventions? What is the impact of stage-specific interventions on eco-friendly shopping decisions when socio-psychological factors such as personal norms and attitudes are also considered?

To investigate the stage-specific effect of social norm interventions in more detail, we used the four stages and relevant socio-psychological factors taken from the SSBC to develop appropriate

experimental treatments. While the social dimension (social influence, social comparisons) was also considered (Sailer et al., 2014), other factors, such as price, brand and variations in product placement, were not. Psychological effects and measures that influence behavioural change more unconsciously (e.g., nudges) were not included in the scope of our theoretical framework, since such unconscious measures are mainly only effective for singular decisions (Marchiori et al., 2017). However, if new persistent purchasing patterns are to be developed, especially among people who have just developed a new intention, psychological aspects such as motivation, attitudes, etc. must also be considered. Nevertheless, nudges (e.g., feedback, reminders) could be used in later stages of the model when people are already highly motivated.

2.3 | Stage-specific development of the experimental treatments

2.3.1 | Predecisional stage

People in the first stage are unaware of the necessity to implement a new behaviour (Bamberg, 2013a; Ohnmacht et al., 2017). Since internalised social norms, so called personal norms, have a major impact on people's intention to become an environmentally-friendlier consumer (Bamberg, 2013b), consumers' awareness can be directed towards social norms to activate and strengthen their personal norms. These can be context-specific injunctive (i.e., what ought to be done) or perceived descriptive (i.e., what most people do) social norms (Cialdini et al., 1990). A virtual *shopping assistant* was implemented as a treatment aimed at this first stage of behavioural change. The assistant was designed to provide social norm information that reflects how a consumer should behave (injunctive norm) and indicated that a certain product should be chosen because it is the 'right' one. It was assumed that people would follow the recommendation of the shopping assistant because they feel morally obliged to make a positive contribution to environmental protection (i.e., establishing a personal norm). With regard to the first treatment, we intended to test the hypothesis that a shopping assistant is more effective for people in the predecisional stage than interventions that are not tailored to this stage of the behavioural change process (i.e., stage non-specific interventions) (H1).

2.3.2 | Preactional stage

This stage is primarily about forming a behavioural intention, for example, selecting a concrete behaviour that serves to achieve the goal of purchasing eco-friendly products (Bamberg, 2013a; Ohnmacht et al., 2017). To select an alternative, new behaviour in the first place, information on the advantages and disadvantages of this new behaviour must be available. For example, information about the positive effects of a change in behaviour can help to build a positive attitude towards the new behaviour (Frick, 2003). This can be information

about what certain people or groups have already achieved. Therefore, we assumed that *success stories* would be able to support people in the preactional stage. In addition, showing that other people have been able to achieve a supposedly difficult goal could help to increase subjectively perceived behavioural control, which is also an important psychological factor at this stage. With regard to the second treatment, we intended to test the hypothesis that success stories are more effective for people in the preactional stage than interventions that are stage non-specific (H2).

2.3.3 | Actional stage

The actional stage is about establishing and implementing behavioural intentions (Bamberg, 2013a; Ohnmacht et al., 2017). At this stage, the new behaviour has not yet been implemented, although initial intentions have been formed. Showing a person the concrete plans and goals other users typically set themselves (e.g., if you buy meat, then select the meat from the local farmer), could help them to implement a new behaviour and avoid possible obstacles or concerns that prevent them from making a change. *Commitments to specific behavioural tips* may therefore be a suitable intervention at this stage (Lokhorst et al., 2011). With regard to the third treatment, we intended to test the hypothesis that specific behavioural tips are more effective for people in the actional stage than interventions that are stage non-specific (H3).

2.3.4 | Postactional stage

People in the last stage perform the new behaviour and, in the best case, maintain it (Bamberg, 2013a; Ohnmacht et al., 2017). Interventions such as feedback on purchases made, or rewards through points and leader boards, which visualise the comparison of one's own performance with others, appear to be effective at keeping a person motivated over the long term and consolidating the behaviour. In this study, we selected *feedback* as the treatment for this stage. With regard to the fourth treatment, we intended to test the hypothesis that feedback is more effective for people in the postactional stage than interventions that are stage non-specific (H4).

3 | METHOD AND MATERIALS

The four treatments were implemented in an online experiment. The next section details how the experiment was conducted.

3.1 | Procedure

To answer our research question of whether the impact of our treatments on eco-friendly purchasing decisions is stage-specific, we conducted an online experiment using a true-to-the-original online food

shop built with WordPress (<https://www.foodshop.li/>). At the beginning of the experiment, participants received a shopping list and they were given the task of buying ingredients for a spaghetti dish; the environmental impact of various ingredients in the dish was known (Kolly et al., 2019). They were asked to select one product from each of several product categories. To avoid price effects as much as possible, participants were told that they were making the purchase with a shopping voucher. Some instructions on the functionality of the shop were provided, before they were directed into the online shop and randomly assigned to one of the four experimental (*shopping assistant*, *success story*, *commitment*, and *feedback*) treatments or the control (no treatment) group. After they had finished shopping, the participants were transferred back to a survey. Instead of a pretest–posttest design, we decided to implement the experiment as a post-test only control group design, since we wanted to avoid the participants being exposed to the shopping situation more than once, which could have resulted in demand bias (McCambridge et al., 2012).

3.2 | Stimulus materials

The study materials were displayed in the online food shop based on the assigned condition (see Supplementary Material for pictures of each treatment). In the *shopping assistant* experimental treatment, a human-shaped figure was displayed next to the eco-friendliest products in each product category. The function of this *shopping assistant* was explained on the start page of the web shop. Since there was no scientific basis for how an effective assistant should look, motivated by some chatbot studies (Ciechanowski et al., 2019; Følstad et al., 2018; Toader et al., 2020), we checked in advance how the appearance of different shopping assistants would be perceived. We tested six different figures for likability, static credibility (McCroskey, 1971; McCroskey & Young, 1981), trustworthiness (Eisend, 2006), perceived intelligence (Bartneck et al., 2009), homophily (Nowak & Rauh, 2005), closeness (Lee et al., 2020), and anthropomorphism (Stein & Ohler, 2017; Toader et al., 2020). Based on the pretest results (see Supplementary Material), we chose the picture.

The second experimental condition, *success stories*, assumed that examples of other people who were able to implement certain behaviours speaking of the advantages of these behaviours, such as purchasing less meat or buying seasonal food, could help to form a behavioural intention. Four qualitatively pretested pictures of people (representing one young male, one young female, one middle-aged male and one middle-aged female) that characterise people in the study's target group were chosen. The quotes were targeted to mention environmentally relevant behaviour (e.g., consuming less meat, buying more local products) as well as how and what the role models had managed to do (e.g., eat less meat through more creative recipes).

The third experimental condition, *commitment with specific behavioural tips*, for people in the actional stage was implemented with a popup window that appeared on the start page of the shop. The window contained three specific tips on how to make an eco-friendly purchase. By clicking on 'Yes, I want to make an eco-friendly purchase',

the respondent was able to commit to implementing these tips. To allow free choice, it was also possible to refuse the commitment. To reinforce the feeling of commitment among those who agreed, a dynamic name list was displayed at the bottom of the screen showing that other people had also made a commitment.

The *feedback* treatment for people in the postactional stage explained on the start page of the online shop that the products were colour-coded according to how eco-friendly they were. A red dot meant not very eco-friendly, an orange dot represented medium environmental friendliness and a green dot was used to signify eco-friendliness. After a product was selected and placed in the shopping basket, a bar was displayed that indicated the total environmental friendliness of the shopping basket. This information was dynamically adjusted after each product choice. In this way, subjects received direct feedback on the environmental friendliness of their choices.

For all of the experimental groups, we also asked whether the treatments were perceived by the participants and how they rated the treatments' effectiveness (manipulation check, for items see Table 1). The manipulation check questions were specifically formulated for each intervention to allow people to be excluded from analyses. For reasons of conciseness, relevant results from the explicit ratings are only referred to in the discussion section.

3.3 | Participants

Data collection took place in autumn 2020. Participants were acquired via the Zurich University of Applied Sciences (ZHAW) research panel, including university students and employees, and a separate panel of psychology students from the University of Zurich. The survey was accessed 3370 times. After checking confirmation of the privacy policy and data cleansing, the final data set included responses from 855 participants. The mean age of the sample was $M = 26.01$ ($SD = 7.11$) years and 22.9% of the participants were male. The respondents do not represent the Swiss population, but they are an important target group when it comes to online shopping. More than 80% of 15–29-year-olds shop online in Switzerland (Federal Statistical Office, 2022). The average completion time for the survey was 18 minutes. When analysing the data, we only considered participants who stated that they had perceived the intervention based on the manipulation checking questions, 157 (18.4%) in total were excluded. For descriptive statistics of the variables according to stage, please see Table 2.

3.4 | Measures

The most important variables from the survey are described below.

3.4.1 | Stages of behavioural change

The stage allocation question was deliberately asked after the purchase to avoid behavioural influence during the shopping process.

TABLE 1 Descriptive statistics for manipulation check variables (data is presented as mean \pm standard deviation)

| Manipulation check variables | Stage | | | |
|---|--------------------------------|------------------------------|---------------------------|-------------------------------|
| | Predecisioner <i>n</i> = 20 | Preactioner <i>n</i> = 32 | Actioner <i>n</i> = 19 | Postactioner <i>n</i> = 66 |
| Shopping assistant | | | | |
| The shopping assistant... | | | | |
| was used to label environmentally friendly products. | 3.75 \pm 1.29 | 3.81 \pm 1.12 | 4.05 \pm 1.03 | 4.08 \pm 1.04 |
| was used to label particularly inexpensive products. | 1.75 \pm .85 | 1.66 \pm .79 | 1.89 \pm .94 | 1.77 \pm .99 |
| was used to label particularly popular products. | 2.65 \pm 1.27 | 2.25 \pm 1.19 | 2.11 \pm .94 | 2.27 \pm 1.14 |
| was used to label particularly healthy products. | 2.80 \pm 1.24 | 2.69 \pm 1.06 | 2.37 \pm 1.10 | 2.61 \pm 1.18 |
| The labelling by the assistant was helpful for me. | 1.65 \pm .81 | 2.63 \pm 1.19 | 1.95 \pm 1.13 | 2.20 \pm 1.14 |
| The labelling by the assistant was credible. | 2.80 \pm 1.28 | 2.97 \pm 1.12 | 3.05 \pm .97 | 2.77 \pm 1.01 |
| I took the assistant into account in my product selection. | 1.35 \pm .67 | 2.12 \pm 1.21 | 2.00 \pm 1.16 | 2.09 \pm 1.15 |
| The labelling by the assistant made shopping easier for me. | 1.70 \pm .98 | 2.13 \pm 1.07 | 1.89 \pm 1.10 | 2.08 \pm 1.18 |
| The assistant labelling motivated me to choose environmentally friendly products. | 1.65 \pm .93 | 2.41 \pm 1.19 | 2.11 \pm 1.24 | 2.06 \pm 1.12 |
| I would prefer a virtual assistant that advises me personally. | 1.60 \pm .88 | 2.31 \pm 1.09 | 2.11 \pm .94 | 2.08 \pm 1.18 |
| I would like to choose for myself what this assistant should look like. | 2.55 \pm 1.64 | 2.44 \pm 1.41 | 2.11 \pm 1.05 | 2.30 \pm 1.50 |
| Success story | | | | |
| The person(s)... | <i>n</i> = 12 | <i>n</i> = 21 | <i>n</i> = 13 | <i>n</i> = 59 |
| has/have managed to consume less meat. | 3.75 \pm .87 | 3.57 \pm .87 | 4.23 \pm .73 | 3.85 \pm 1.064 |
| find(s) that it is easy to eat in an environmentally friendly way. | 3.25 \pm .87 | 3.14 \pm .73 | 3.62 \pm .65 | 3.54 \pm .93 |
| buy(s) seasonal products from the region. | 4.00 \pm .74 | 3.86.66 | 4.23 \pm .60 | 4.00 \pm .95 |
| eat(s) less meat for environmental reasons. | 3.75 \pm .75 | 3.57 \pm .75 | 4.23 \pm .73 | 3.93 \pm 1.05 |
| The success stories... | | | | |
| show me that it is easy to eat in an environmentally friendly way. | 3.00 \pm .95 | 2.71 \pm .85 | 2.85 \pm .99 | 3.36 \pm 1.01 |
| have motivated me to buy in a more environmentally friendly way. | 2.25 \pm .62 | 3.05 \pm 1.20 | 2.62 \pm .96 | 2.88 \pm 1.26 |
| I could basically identify with the senders of these success stories. | 2.67 \pm .78 | 3.10 \pm .89 | 3.23 \pm .73 | 3.42 \pm 1.10 |
| I found the success stories credible. | 3.33 \pm .89 | 3.05 \pm .81 | 3.54 \pm 1.20 | 3.61 \pm .97 |
| Success stories of this kind help me to shop in a more environmentally friendly way. | 2.08 \pm .52 | 2.86 \pm 1.01 | 2.54 \pm 1.13 | 2.76 \pm 1.18 |
| The people who submitted their quotes made a likeable impression. | 3.67 \pm .65 | 3.48 \pm .98 | 4.15 \pm .69 | 4.05 \pm .68 |
| Commitment | | | | |
| The public commitment (names on the list 'Food.li LIVE') have motivated me to shop more environmentally friendly too. | <i>n</i> = 7 | <i>n</i> = 15 | <i>n</i> = 8 | <i>n</i> = 45 |
| The tips have helped me to shop in a more environmentally friendly way. | 2.14 \pm 1.22 | 1.93 \pm .88 | 2.50 \pm 1.20 | 1.93 \pm .99 |
| I found the public commitment (names on the list 'Food.li LIVE') credible. | 2.43 \pm .79 | 3.00 \pm .85 | 2.63 \pm .92 | 2.89 \pm .98 |
| The tips were comprehensible to me. | 2.57 \pm .98 | 2.40 \pm .74 | 2.75 \pm 1.39 | 2.49 \pm 1.06 |
| The tips were comprehensible to me. | 3.14 \pm 1.22 | 3.47.1.06 | 3.38 \pm 1.19 | 3.80 \pm .94 |

(Continues)

TABLE 1 (Continued)

| Commitment | n = 7 | n = 15 | n = 8 | n = 45 |
|---|-------------|-------------|-------------|-------------|
| It would have motivated me even more if I could not have made my intention to buy green publicly (without names on a list). | 2.00 ± 1.16 | 2.87 ± 1.30 | 3.13 ± .99 | 2.69 ± 1.15 |
| Feedback | n = 20 | n = 26 | n = 20 | n = 100 |
| The information that more customers are buying environmentally friendly products has motivated me to do the same. | 3.20 ± .95 | 3.04 ± 1.15 | 3.10 ± 1.21 | 2.73 ± 1.25 |
| The environmental rating of the products motivated me to buy environmentally friendly. | 3.20 ± 1.11 | 3.92 ± 1.06 | 3.30 ± 1.13 | 3.38 ± 1.29 |
| The environmental rating was helpful. | 4.00 ± .92 | 4.27 ± .83 | 3.95 ± 1.10 | 3.78 ± 1.13 |
| The environmental rating is credible. | 3.55 ± .99 | 3.54 ± .71 | 3.70 ± .98 | 3.64 ± .96 |
| An environmental rating is important to me. | 3.50 ± .89 | 4.27 ± .67 | 3.80 ± 1.06 | 3.93 ± 1.07 |
| The environmental rating made my decision easier. | 2.65 ± 1.35 | 4.04 ± 1.04 | 2.50 ± 1.19 | 3.09 ± 1.26 |
| I took the environmental rating into account when shopping. | 3.10 ± .97 | 3.62 ± 1.1 | 2.50 ± 1.10 | 3.24 ± 1.24 |
| The direct display of the environmental rating with my purchase has motivated me to buy in a more environmentally friendly way. | 3.30 ± .92 | 4.04 ± 1.04 | 3.30 ± 1.30 | 3.40 ± 1.31 |
| A direct display of the environmental rating for my purchase is an added value for me. | 4.05 ± .69 | 4.38 ± .70 | 4.25 ± .55 | 4.11 ± 1.04 |
| A comparison of my score with other groups of people would have motivated me even more. | 2.40 ± .94 | 2.38 ± 1.20 | 3.05 ± 1.40 | 2.21 ± 1.1 |

Note: Scale level for all items: 5-point scale with 1 = *strongly disagree* to 5 = *strongly agree*; sample size of the respective stage differs from the sample of the regression models, because the control group did not receive manipulation check questions.

Stage assignments were performed using the method applied by Klöckner (2017) with the items adapted to the context of eco-friendly food shopping: (1) *I don't pay attention to the environmental friendliness of products when I shop, and I don't see the need to change anything* (predecision stage). (2) *I know I should shop in an environmentally friendlier way, but at this point I feel that this is impossible for me* (predecision). (3) *I would like to shop in an environmentally friendlier way, but at this point I am unsure how to make it happen* (preactional). (4) *I know how to shop in an environmentally friendly way, but I haven't put it into practice yet* (actional stage). (5) *I have been shopping in an environmentally friendly way for the last few months* (postactional). Statements (1) and (2) were coded as an indication of the predecision stage. The distribution of the subjects in the individual stages is as follows: predecisional: $n = 135$, preactional: $n = 155$, actional: $n = 108$ and postactional: $n = 457$ (total sample was $N = 855$). In the context of the study, it was assumed that a person's stage affiliation should be considered a stable characteristic of the person during the study. It was not assumed that participation in the experiment resulted in individuals moving further along in the change process.

3.4.2 | Dependent variable (outcome)

Points were assigned to each product in advance as a rating of their environmental friendliness (1 for not very environmentally friendly, up to 3 for environmentally friendly), and the scoring was reviewed by

experts from the Life Cycle Assessment Research Group (K. Muir, Personal Communication, 14 September 2020). For the environmental performance score, the mean value was calculated from the number of selected products and the points. A total of 57 products could be chosen in the shop. The mean score for the 855 participants was $M = 2.1$ ($SD = .31$, range: 1.5–2.9).

3.4.3 | Personal norm

When forming an intention to achieve a goal, subjectively perceived social norms play a particular role, which in turn influence a person's own conviction to behave in a certain way (Bamberg et al., 2015; Thøgersen & Olander, 2006). Based on Doran and Larsen (2016), each participant's personal norm was defined by 4 items on a 5-point scale. An example of such an item was 'I feel morally obliged to (1) pay more for environmentally friendly food if it helps to protect the environment'. For the exact wording of the items, see Table 2. The scale had an internal consistency (Cronbach's α) of $\alpha = .82$ for the 855 subjects.

3.4.4 | Subjectively perceived descriptive and injunctive norm

Information about how other people behave (descriptive norm) or how one should behave (injunctive norm) can be conducive to forming an

TABLE 2 Descriptive statistics for the variables according to stage (data is presented as mean \pm standard deviation for the continuous variables and as frequencies [%] for the categorical variables)

| Variables | Stage | | | |
|---|--|---|--|--|
| | Predecisioner <i>n</i> = 94 (11% of total <i>N</i>) | Preactioner <i>n</i> = 137 (16% of total <i>N</i>) | Actioner <i>n</i> = 82 (9% of total <i>N</i>) | Postactioner <i>n</i> = 385 (45% of total <i>N</i>) |
| Number of cases who passed manipulation check | | | | |
| Sex | | | | |
| Male | 24.5% | 12.4% | 24.4% | 24.2% |
| Female | 75.5% | 85.4% | 75.6% | 75.1% |
| Age | 25.09 \pm 5.79 | 24.79 \pm 5.15 | 25.18 \pm 7.26 | 26.73 \pm 7.43 |
| Responsibility for purchasing | | | | |
| Myself | 24.5% | 29.2% | 22.0% | 29.9% |
| Another person and I | 52.1% | 49.6% | 47.6% | 55.3% |
| Another person | 23.4% | 21.2% | 30.5% | 14.8% |
| Current dietary habits | | | | |
| Exclusively vegetable | 3.2% | 5.1% | 7.3% | 14.0% |
| Plant and animal based (e.g., eggs), but no meat and fish | 9.6% | 13.9% | 11.0% | 19.5% |
| Plant and animal based, but no meat | 7.4% | 8.8% | 9.8% | 6.2% |
| Everything, eating meat and fish 1–2 times a week | 50.0% | 51.8% | 40.2% | 40.8% |
| Everything, also very much meat and fish | 19.1% | 9.5% | 24.4% | 7.5% |
| Environmental performance score (Each product was rated from 1 to 3 where 3 was awarded for an environmentally friendly product. The sum was divided by the number of products purchased) | 1.94 \pm .26 | 2.1 \pm .31 | 2.01 \pm .28 | 2.2 \pm .29 |
| Personal norm (α = .82; 5-point scale with 1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>) | 3.38 \pm .74 | 3.66 \pm .69 | 3.41 \pm .74 | 4.01 \pm .72 |
| I feel morally obliged to... | 3.44 \pm .95 | 3.86 \pm .79 | 3.61 \pm .87 | 4.26 \pm .88 |
| pay more for environmentally friendly food if it helps to protect the environment. | | | | |
| buy environmentally friendly food, even if it means I have to limit my choices. | 3.62 \pm .96 | 3.84 \pm .89 | 3.57 \pm .92 | 4.14 \pm .86 |
| buy environmentally friendly food, even if this might be more time consuming. | 3.44 \pm .98 | 3.72 \pm .905 | 3.37 \pm 1.0 | 4.10 \pm .9 |
| buy environmentally friendly food, even if it does not always match my preferences. | 3.03 \pm 1.02 | 3.20 \pm .99 | 3.10 \pm 1.06 | 3.53 \pm 1.08 |
| Perceived social norm (descriptive) (α = .48) | 2.91 \pm .61 | 3.10 \pm .61 | 3.03 \pm .51 | 3.27 \pm .59 |
| (5-point scale with 1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>) | | | | |
| How widespread do you think environmentally friendly shopping is? Please indicate to what extent you agree with the following statements: Environmentally friendly shopping... | | | | |
| is widespread among other people of my age | 2.83 \pm .94 | 3.18 \pm .86 | 3.13 \pm .84 | 3.13 \pm .84 |
| is widespread in my personal environment | 3.12 \pm .89 | 3.27 \pm .92 | 3.09 \pm .88 | 3.71 \pm .84 |
| is widespread in the Swiss population | 2.79 \pm .77 | 2.73 \pm .77 | 2.87 \pm .66 | 2.84 \pm .79 |
| Perceived social norm (injunctive) (α = .54; 5-point scale with 1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>) | 3.55 \pm .55 | 3.54 \pm .48 | 3.60 \pm .56 | 3.65 \pm .55 |
| To what extent do you think environmentally friendly shopping is advocated or not advocated? Please indicate to what extent you agree with the following statements: | 3.44 \pm .82 | 3.58 \pm .69 | 3.59 \pm .75 | 3.55 \pm .76 |
| Other people of my age are in favour of buying environmentally friendly products. | | | | |
| People in my personal environment are in favour of buying environmentally friendly products. | 3.69 \pm .75 | 3.66 \pm .77 | 3.62 \pm .86 | 4.01 \pm .74 |

(Continues)

TABLE 2 (Continued)

| Variables | Stage | | | |
|--|--|---|---------------------------------------|---|
| | Predecisioner | Preactioner | Actioner | Postactioner |
| Number of cases who passed manipulation check | <i>n</i> = 94 (11% of total <i>N</i>) | <i>n</i> = 137 (16% of total <i>N</i>) | <i>n</i> = 82 (9% of total <i>N</i>) | <i>n</i> = 385 (45% of total <i>N</i>) |
| The Swiss population is in favour of buying environmentally friendly products. | 3.53 ± .74 | 3.38 ± .72 | 3.60 ± .66 | 3.40 ± .74 |
| Self-efficacy expectations (5-point scale with 1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>) | | | | |
| Self-efficacy (milk, meat) ($\alpha = .74$; 5-point scale with 1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>) | 2.60 ± 1.1 | 2.84 ± 1.1 | 2.93 ± 1.19 | 3.24 ± 1.25 |
| How well do you now trust yourself to carry out the following behaviours? I trust myself to | | | | |
| ... to do without animal foods such as meat and fish | 2.94 ± 1.37 | 3.36 ± 1.33 | 3.23 ± 1.44 | 3.71 ± 1.39 |
| ... to do without dairy products such as cheese, milk and butter. | 2.20 ± 1.21 | 2.32 ± 1.18 | 2.63 ± 1.26 | 2.77 ± 1.41 |
| Self-efficacy (bio, regional) ($\alpha = .43$) (5-point scale with 1 = <i>strongly disagree</i> to 5 = <i>strongly agree</i>) | | | | |
| How well do you now trust yourself to carry out the following behaviours? I trust myself to | | | | |
| ... buy regional seasonal fruits and vegetables, (even if, for example, the choice is more limited.) | 4.12 ± .93 | 4.26 ± .79 | 3.99 ± .73 | 4.45 ± .68 |
| ... buy food from controlled organic cultivation (even if it is more expensive) | 3.40 ± .99 | 3.72 ± .95 | 3.57 ± 1.01 | 4.22 ± .83 |
| Attitude (regional, season) ($\alpha = .62$) (1 = <i>very bad</i> to 5 = <i>very good</i>) | | | | |
| What do you think in general about the following behaviours? | | | | |
| I think buying regional food is ... | 4.68 ± .64 | 4.85 ± .38 | 4.71 ± .56 | 4.88 ± .36 |
| Buying food (fruit and vegetables) that is in season in my region, I find ... | 4.76 ± .54 | 4.85 ± .43 | 4.72 ± .53 | 4.90 ± .30 |

Note: *N* = 855. 157 (18.36%) participants were excluded in total due to failing manipulation check requirements. Exclusion per stage was for Predecisioner: 41 participants; Preactioner: 18 participants; Actioner: 26 participants, Postactioner: 72 participants.

initial intention to achieve a goal. Perceived descriptive and injunctive norms were modified to the context and defined according to Jacobson et al. (2015). The scale had an internal consistency of $\alpha = .48$ (descriptive norm) and $\alpha = .54$ (injunctive norm) for the 855 subjects.

3.4.5 | Self-efficacy expectations

Coping with demands and tasks requires expectations of self-efficacy. While strengthening this sense of feasibility is especially important during the first stage of behavioural change, it also plays a role in the other stages (Schwarzer, 1992). Expectations of self-efficacy were measured according to Frick (2003).

The scale was constructed according to Bandura's (2006) recommendations, using possible barriers to action (see, among others, Lea & Worsley, 2003; Piazza et al., 2015) for the behaviours.

After conducting a factor analysis to check internal consistency, a 2-component solution was decided upon. Self-efficacy expectancy is

thus composed of two thematically matching variables. For the first variable, the following items were included ... *to give up eating meat and/or fish* and ... *to give up dairy products, for example, cheese, milk, butter* ($\alpha = .74$). For the second variable, the items were ... *to buy regional seasonal fruits and vegetables, (even if e.g., the choice is more limited.)* and ... *to buy food from controlled organic cultivation (even if these are e.g., more expensive.)* ($\alpha = .43$).

3.4.6 | Attitude

According to static theories of behaviour like the theory of planned behaviour (for an overview see e.g., Godin and Kok (1996)), it is empirically very well established that attitude influences behavioural intention and thus indirectly affects actual behaviour. In this study, attitude towards the target behaviour was measured by eight items that had to be rated on a scale from very good or very bad. Since the items were self-formulated based on Frick (2003), exploratory factor

analysis was conducted to establish the factor structure, resulting in a two-factor solution which explained 49.1% of the variance. Since the reliability analysis delivered poor internal consistency results for the proposed two-factor solution, we finally decided on a one factor-solution with two items that also made thematical sense ($\alpha = .66$).

4 | RESULTS

A hierarchical linear regression analysis was conducted to predict environmental purchasing of individuals at each stage based on each treatment. The main focus was on testing our four research hypotheses. In addition, we also controlled for the socio-psychological factors of behavioural change described in the literature. All analyses were run with IBM SPSS Statistics 27. We inserted the variables into the regression model in a block-wise manner. For each block, we used the 'Enter' procedure for variable selection, in which all variables in a block are entered in a single step. In the first block, a model was built from the treatment variables to test the mere effect of our interventions. In the second block, the stage-specific socio-psychological variables were added to examine if they improved the explanatory power of our model. Since we assumed that according to theory the treatments have a stage-specific effect (see hypotheses H1-H4 above), four separate regression models were calculated for the respective groups: predecisioner, preactioner, actioner and postactioner. When forming the groups, the manipulation check was also considered in addition to the self-reported stage affiliation. Only participants who stated that they had noticed the treatment were considered. The shopping assistant, success story, commitment, and feedback treatment variables in the regression models were dummy coded with the control group taken as a reference level. Since the group of actioners was quite small and the requirement for a normal distribution was violated, we employed a bootstrapping methodology (Kuonen, 2005), using Efron's bias-corrected and accelerated (BCa) method (see Efron and Tibshirani (1993) with 1000 iterations.

4.1 | Descriptive characteristics of the four groups (stages)

Table 2 presents the descriptive statistics for the variables of interest for each stage of behavioural change, but only for participants who passed the manipulation check. The four stage groups were similar in terms of age and gender distribution; however, there was a higher number of vegetarians among the postactioners. Unexpectedly, there were many heavy meat and fish eaters in the actioners group. Descriptive analysis of the socio-psychological variables showed that there was a general trend towards increased self-efficacy from stage to stage. Furthermore, the degree to which people expressed personal and perceived descriptive norms also increased from stage to stage. However, this was not the case for actioners, who had lower than expected values for the socio-psychological variables. Attitudes were relatively similar and the degree to which they were expressed was

relatively high at all four stages. This indicated that the people who were attracted to participate in the study generally had a high level of environmental awareness. As one would expect, participants at higher stages of behavioural change achieved higher values for the environmental performance score compared to participants at the first stage.

4.2 | Main effects

The degree to which purchasing decisions were influenced by the treatments and the stage-specific predictors is depicted in Table 3. We were aware that the influence of the socio-psychological variables may not be statistically significant, especially at lower stages. However, to be able to make comparisons between the four stages of behavioural change, we decided to use identical regression models for all four stages.

4.2.1 | Predecisional stage

From the regression analysis of participants at the predecisional stage it appears that the treatments in the first model could significantly predict participants' environmental performance scores. The results of the regression indicated that the model explained 16.5% of the variance and that the model was a significant predictor of sustainable consumption, $F(4, 89) = 4.40, p = .003$. Among the four treatments, the commitment treatment ($B = .29, p = .001$) and feedback treatment ($B = .21, p = .004$) contributed significantly to the model. Both treatments increased the environmental friendliness of the purchase by 0.29 and 0.21 points respectively compared to the control group. By including the other stage relevant socio-psychological factors, it was possible to observe a change in the regression coefficients in the regression model. The second model explained 26.5% of the variance, $F(10, 83) = 2.99, p = .003$, with the commitment treatment ($B = .25, p = .001$) and the feedback treatment ($B = .21, p = .003$) contributing significantly to the model. This suggests that even after controlling for socio-psychological factors, the effects of the treatments remain significant. However, although we found that two of treatments had significant effects, these results did not support our hypothesis H1, since we expected the shopping assistant treatment to be the most effective one for predecisioners. Interestingly, for participants at the first stage, none of the socio-psychological factors significantly predicted how eco-friendly the purchasing decision would be.

4.2.2 | Preactional stage

For people at the preactional stage, the regression model explains 9.2% of the variance and was a significant predictor of sustainable consumption, $F(4, 132) = 3.35, p = .01$. Only the feedback treatment contributed significantly to the model ($B = .20, p = .009$). For the second model the results of the regression indicated that the predictors explained 21.8% of the variance. In addition to the feedback

TABLE 3 Results of hierarchical regression

| Predictors | Set statistics | | | Decomposition of set statistics | | | | |
|---|----------------|-------|-------------------|---------------------------------|------|---------|--------|-------|
| | | | | | | | 95% CI | |
| | ΔR^2 | R^2 | F change | B | SE B | β | LL | UL |
| Predecisioner ($n = 94$) ^a | | | | | | | | |
| Step 1. Treatments | 0.17 | 0.17 | 4.40** | | | | | |
| Shopping assistant ($n = 20, 21.3\%$) | | | | 0.06 | 0.07 | 0.10 | -0.08 | 0.20 |
| Success story ($n = 12, 12.8\%$) | | | | 0.10 | 0.08 | 0.13 | -0.06 | 0.26 |
| Commitment ($n = 12, 12.8\%$) | | | | 0.29 | 0.08 | 0.39** | 0.13 | 0.45 |
| Feedback ($n = 20, 21.3\%$) | | | | 0.21 | 0.07 | 0.33** | 0.07 | 0.34 |
| Step 2. Socio-psychological factors | 0.10 | 0.27 | 1.88 ¹ | | | | | |
| Shopping assistant | | | | 0.08 | 0.07 | 0.12 | -0.06 | 0.21 |
| Success story | | | | 0.07 | 0.08 | 0.10 | -0.09 | 0.24 |
| Commitment | | | | 0.25 | 0.08 | 0.33** | 0.09 | 0.42 |
| Feedback | | | | 0.21 | 0.07 | 0.34** | 0.08 | 0.35 |
| Personal norm | | | | 0.08 | 0.05 | 0.23 | -0.02 | 0.17 |
| Perceived social norm des. | | | | 0.04 | 0.05 | 0.09 | -0.07 | 0.14 |
| Perceived social norm inj. | | | | -0.02 | 0.06 | -0.05 | -0.14 | 0.10 |
| Self-efficacy (milk, meat) | | | | 0.04 | 0.03 | 0.15 | -0.02 | 0.09 |
| Self-efficacy (bio, regional) | | | | 0.01 | 0.05 | 0.03 | -0.09 | 0.11 |
| Attitude (regional, season) | | | | -0.02 | 0.05 | -0.04 | -0.12 | 0.09 |
| Preactioner ($n = 137$) ^b | | | | | | | | |
| Step 1. Treatments | 0.09 | 0.09 | 3.35* | | | | | |
| Shopping assistant ($n = 32, 23.4\%$) | | | | -0.07 | 0.07 | -0.09 | -0.21 | 0.07 |
| Success story ($n = 21, 15.3\%$) | | | | 0.08 | 0.08 | 0.10 | -0.07 | 0.24 |
| Commitment ($n = 19, 13.9\%$) | | | | -0.01 | 0.08 | -0.01 | -0.17 | 0.15 |
| Feedback ($n = 26, 19\%$) | | | | 0.20 | 0.07 | 0.26** | 0.05 | 0.33 |
| Step 2. Socio-psychological factors | 0.26 | 0.22 | 3.37** | | | | | |
| Shopping assistant | | | | 0.00 | 0.07 | 0.00 | -0.14 | 0.14 |
| Success story | | | | 0.08 | 0.08 | 0.09 | -0.08 | 0.23 |
| Commitment | | | | 0.02 | 0.08 | 0.03 | -0.14 | 0.18 |
| Feedback | | | | 0.21 | 0.07 | 0.27** | 0.07 | 0.35 |
| Personal norm | | | | 0.12 | 0.04 | 0.25** | 0.03 | 0.19 |
| Perceived social norm des. | | | | 0.04 | 0.04 | 0.09 | -0.06 | 0.11 |
| Perceived social norm inj. | | | | -0.08 | 0.06 | -0.19* | -0.23 | -0.01 |
| Self-efficacy (milk, meat) | | | | 0.04 | 0.02 | 0.11 | -0.01 | 0.08 |
| Self-efficacy (bio, regional) | | | | 0.03 | 0.05 | 0.05 | -0.07 | 0.13 |
| Attitude (regional, season) | | | | -0.01 | 0.08 | -0.01 | -0.14 | 0.16 |
| Actioner ($n = 82$) bootstrapped ^c | | | | | | | | |
| Step 1. Treatments | 0.02 | 0.02 | 0.39 | | | | | |
| Shopping assistant ($n = 19, 23.2\%$) | | | | -0.02 | 0.09 | -0.02 | -0.20 | 0.17 |
| Success story ($n = 13, 15.9\%$) | | | | 0.08 | 0.10 | 0.10 | -0.13 | 0.29 |
| Commitment ($n = 12, 14.6\%$) | | | | 0.09 | 0.11 | 0.11 | -0.13 | 0.30 |
| Feedback ($n = 20, 24.4\%$) | | | | 0.05 | 0.09 | 0.06 | -0.15 | 0.22 |
| Step 2. Socio-psychological factors | 0.27 | 0.29 | 4.40** | | | | | |
| Shopping assistant | | | | 0.06 | 0.09 | 0.10 | -0.11 | 0.24 |
| Success story | | | | 0.13 | 0.10 | 0.16 | -0.07 | 0.32 |
| Commitment | | | | 0.19 | 0.10 | 0.23 | -0.02 | 0.40 |

TABLE 3 (Continued)

| Predictors | Set statistics | | | Decomposition of set statistics | | | | |
|---|----------------|-------|----------|---------------------------------|------|---------|--------|------|
| | ΔR^2 | R^2 | F change | B | SE B | β | 95% CI | |
| | | | | | | | LL | UL |
| Feedback | | | | 0.06 | 0.09 | 0.10 | -0.11 | 0.23 |
| Personal norm | | | | 0.10 | 0.05 | 0.26* | 0.00 | 0.20 |
| Perceived social norm des. | | | | -0.09 | 0.06 | -0.17 | -0.22 | 0.03 |
| Perceived social norm inj. | | | | -0.07 | 0.06 | -0.13 | -0.18 | 0.05 |
| Self-efficacy (milk, meat) | | | | 0.01 | 0.03 | 0.05 | -0.04 | 0.06 |
| Self-efficacy (bio, regional) | | | | 0.09 | 0.06 | 0.18 | -0.03 | 0.21 |
| Attitude (regional, season) | | | | 0.13 | 0.06 | 0.23* | 0.01 | 0.26 |
| Postactioner ($n = 385$) ^d | | | | | | | | |
| Step 1. Treatments | 0.05 | 0.05 | 4.84** | | | | | |
| Shopping assistant ($n = 66, 17.1\%$) | | | | 0.10 | 0.05 | 0.13** | 0.01 | 0.19 |
| Success Story ($n = 59, 15.3\%$) | | | | -0.01 | 0.05 | -0.01 | -0.10 | 0.08 |
| Commitment ($n = 65, 16.9\%$) | | | | 0.10 | 0.05 | 0.13** | 0.01 | 0.19 |
| Feedback ($n = 100, 26\%$) | | | | 0.15 | 0.04 | 0.22** | 0.07 | 0.23 |
| Step 2. Socio-psychological factors | 0.24 | 0.28 | 20.34** | | | | | |
| Shopping assistant | | | | 0.07 | 0.04 | 0.10 | -0.01 | 0.15 |
| Success story | | | | -0.01 | 0.04 | -0.01 | -0.01 | 0.08 |
| Commitment | | | | 0.08 | 0.04 | 0.10* | 0.00 | 0.16 |
| Feedback | | | | 0.15 | 0.04 | 0.23** | 0.08 | 0.22 |
| Personal norm | | | | 0.06 | 0.02 | 0.16** | 0.02 | 0.10 |
| Perceived social norm des. | | | | -0.02 | 0.03 | -0.04 | -0.07 | 0.03 |
| Perceived social norm inj. | | | | 0.00 | 0.03 | 0.01 | -0.05 | 0.06 |
| Self-efficacy (milk, meat) | | | | 0.07 | 0.01 | 0.31** | 0.05 | 0.09 |
| Self-efficacy (bio, regional) | | | | 0.12 | 0.03 | 0.20** | 0.07 | 0.18 |
| Attitude (regional, season) | | | | 0.02 | 0.05 | 0.02 | -0.08 | 0.12 |

Note: * $p < .05$; ** $p < .01$. ¹.01.

Abbreviations: CI, confidence interval; LL, lower limit; UL, upper limit.

^aAssigned to the control group: $n = 30$ (31.9%).

^bAssigned to the control group: $n = 39$ (28.5%).

^cAssigned to the control group: $n = 18$ (22%).

^dAssigned to the control group: $n = 95$ (24.7%).

treatment ($B = .21, p = .004$), the personal norm ($B = .11, p = .008$) and the perceived injunctive social norm ($B = -.12, p = .03$) also contributed to the model. The positive effect of the feedback treatment on participants' environmental performance scores was not in line with hypothesis H2, where we assumed that the success stories treatment would be the most effective for preactioners. The results show that the injunctive social norm contributed to a decrease in the share of eco-friendly products, an explanation for which is provided in the discussion.

4.2.3 | Actional stage

The third regression model was conducted with people at the actional stage. The model with the treatments as predictors was not

significant. However, the second model was ($F[10, 71] = 2.83, p = .005$), explaining 28.5% of the variance. In addition to the personal norm ($B = .10, p = .04$), attitude also contributed significantly to the model ($B = .13, p = .03$). Contrary to hypothesis H3, when controlling for socio-psychological predictors, the commitment treatment was only marginally significant, but not significant at the 0.05 level ($B = .19, p = .07$).

4.2.4 | Postactional stage

From the regression with people at the postactional stage, it appears that the treatments in the first model were able to predict participants' environmental performance scores. The results of the regression indicated that the model explained 5% of the variance and that

the model was a significant predictor of sustainable consumption. The shopping assistant ($B = .10, p = .03$), commitment ($B = .10, p = .03$) and the feedback ($B = .15, p < .001$) treatments contributed significantly to the model (H4).

When the socio-psychological predictors were included, the model was significant and explained 28.3% of the variance, ($F [10, 374] = 14.73, p < .001$). The following individual predictor variables contributed to the model significantly: Commitment ($B = .08, p = .046$), feedback ($B = .15, p < .001$), personal norm ($B = .06, p = .002$), self-efficacy (milk, meat) ($B = .07, p < .001$) and self-efficacy (bio, regional) ($B = .12, p < .001$). With an increase over the control group of 0.15 points, the feedback treatment contributed the most to green purchasing among postactioners.

5 | DISCUSSION

Since investigating effective measures that contribute to achieving sustainability goals is of paramount importance, the present study investigated the effect of stage-specific interventions that can be integrated relatively easily into common online food shops. Our study was one of the first studies in the field of sustainable consumption that tailored treatments to consumers' intentions to change their behaviour. While we did find evidence of the hypothesised relationship between the treatments' effectiveness and the behavioural change stages into which visitors of an online food shop were grouped, more research is needed to gain a better understanding of this relationship.

Looking at the results from the perspective of the treatments, we discovered that the treatments differed in their effectiveness. It is known from other studies that feedback can be very effective (Berger, 2019; Murimi et al., 2019; Sanguinetti et al., 2018) and this was also confirmed in our study. As expected, the feedback treatment had a strong effect on the postactioners' purchasing behaviours. However unexpectedly, feedback was also effective at the *predecisional* and *preactional* stages. In general, the surprising finding of our study was that although the effectiveness of treatments should depend on the stage of behavioural change to which a person belongs, we did not find the clear relationship between treatment and stage we had expected in our hypothesis. As other treatments would have been possible at each stage (e.g., see the multitude of suggestions in Ohnmacht et al., 2017), it cannot be excluded that the lack of a significant relationship (in particular for the *predecisional* and *preactional* stages) might be due to the specific treatments. In the following sections, we take a closer look at how the treatments could be improved.

For the first, *predecisional stage* we expected that the shopping assistant would act as the sort of injunctive social norm information that is commonly used in persuasion (Cialdini et al., 2006; Ohnmacht et al., 2017). However, for people at this stage, instead of the shopping assistant, commitment and feedback were ultimately shown to be more effective. Although the manipulation check has revealed that people understood the role of the shopping assistant, they did not perceive it as being very motivating or helpful when it came to

choosing eco-friendly products (see Table 1). Thus, one could assume that its effectiveness was reduced due to these negative evaluations. We know from studies in the digital gaming context that the degree of humanity or even identification with an avatar can have an influence on its effect (Kao, 2019; Kao & Harrell, 2015; Nowak & Rauh, 2005, 2008). Perhaps in this case, too much humanity led to reactance. As the shopping assistant recommended the 'right' product (injunctive social norm), it cannot be discounted that these interventions were perceived as direct criticism of the participants' current behaviour and may therefore have triggered reactance (Brehm, 1966). In follow-up studies, other more 'subtle' approaches to convey social norms should be tested at the *predecisional stage*. In addition, it might be valuable to consider further control variables (e.g., identification, degree of humanity) as they are used in studies on avatars and were partly used in the pretest. Apparently, commitment and feedback were more effective at making people aware of the harmful consequences for the environment of their current behaviour and thus promoted awareness of the problem (Bamberg, 2013b; Ohnmacht et al., 2017). The feedback treatment received positive evaluations from the predecisioners (see Table 1).

For the *preactional stage*, we expected the success story to be effective. This is because people at this stage require information about the positives and negatives of different behavioural alternatives to help them select a behaviour that enables them to achieve their goals. In our study, contrary to our assumptions, the success stories with different testimonials did not have an impact, but feedback did. Considering the result that the perceived injunctive social norm had a negative effect on participants' purchasing behaviour, it could again be assumed that the success stories, that is, pictures of happy people living a green lifestyle, were perceived as patronising and triggered reactance, resulting in people choosing fewer green products, despite being aware of the socially approved behaviours. Like the predecisioners, the preactioners also rated the feedback treatment very positively (see Table 1). The extent to which reactance really plays a role could be generally considered more closely in follow-up studies. A very recent study on the topic of backfiring digital nudges from Schabert et al. (2022) and their application of a reactance scale can serve as inspiration here.

It was assumed that goal commitment and specific behavioural tips could be an intervention that would help people at the *actional stage*. As recommended in research by Cialdini (2001), the commitment to the tips was made more powerful by making it public, that is, one's name was visible on the list, using the social norm influence. Although the commitment had a marginally significant effect on the participants' purchasing decisions, we did expect this effect to be stronger. Besides the reduced statistical power due to the small sample size, what was striking about this group was that they expressed a lower-than-expected degree of personal norms, since it was assumed that this would increase from stage to stage (see Table 2). Other studies have pointed out that personal norms can mediate the effect of commitments (Lokhorst et al., 2011), therefore the lower degree to which personal norms were expressed in this group might have affected our experiment. To be able to make a clear statement about

their effectiveness, larger sample sizes are recommended for follow-up studies. In terms of the content of the tips, participants stated in the manipulation check that they were very comprehensible, but only moderately helpful (see Table 1). Therefore, additional interventions to support actioners in implementing their behavioural intentions should be tested in future. If-then plans are successful measures for helping people to implement behavioural intentions (Gollwitzer, 1999) that may work well for weight reduction and reduced meat diets (Rees et al., 2018), to reduce fat intake (Vilà et al., 2017) or resist impulse buying (Thürmer et al., 2020), but we considered them unworkable in the context of online food shopping. We also doubt that tutorials to help formulate if-then plans (Davies et al., 2018) are appropriate for online shopping, which is why we provided the participants with three tips at the beginning of the experiment on how to shop in a more eco-friendly manner.

According to SSBC, people at the *postactional stage* already have experience of implementing the new behaviour. Consumers at this stage need interventions that motivate them to maintain the behaviour. As expected, the points system and the associated feedback on purchasing, which we thought would increase the environmental friendliness in the shopping cart, was the most effective treatment at this stage when controlling for the other socio-psychological factors. The second regression model also indicated that other variables were also relevant here, especially self-efficacy. This was not surprising, especially at the last stage, because someone who exhibits this behaviour is convinced of their ability to behave in this way.

Like self-efficacy, other socio-psychological variables were also integrated in the regression models to explain differences in purchasing behaviours dependent on the stage of behavioural change. In line with theory (Bamberg, 2013b; Ohnmacht et al., 2017), we found that the further advanced people were in the change process, the more the variables had a significant impact on their purchases. However, the results in our study on socio-psychological factors and their stage-specific prediction of eco-friendly purchase decisions were not completely in line with theory and other studies. For example, we did not find attitude to have a clear impact on how green the purchases were. The lack of significant effect for attitude, as well as for some of the other socio-psychological predictors (e.g., perceived social norms, self-efficacy expectations), may be connected to the operationalisation, in which there was no good internal consistency. Regarding self-efficacy, we did not ask stage specific questions for two reasons: First, we rely on pretest results and therefore kept the length of the questionnaire as short as possible and thus reduced the likelihood of participants dropping out (Revilla & Ochoa, 2017), second, we followed a specific behavioural related self-efficacy approach (AbuSabha & Achterberg, 1997). The questions used to establish self-efficacy, however, might have still been too general and not tailored strongly enough to the target groups in order to reach high internal consistency. In future studies, the constructs should be operationalised with better validated and possibly also longer scales. Nevertheless, despite the unsatisfactory internal consistency, we used the constructs in our regression models based on theoretical considerations, since the literature on the stage model of self-regulated

behavioural change assumes that these constructs are important psycho-social predictors of behavioural change (Bamberg, 2013b; Ohnmacht et al., 2017). Revising the measurement instruments to measure the socio-psychological constructs could also increase the explanatory power of our regression models, whose explained variance was relatively low, ranging between 22% and 29%. In addition, future studies could also include additional socio-psychological predictors in the regression model (c.f., Moser et al., 2013)—in line with theory (e.g., the different types of intentions marking the transition points between the stages)—to increase the degree of variance in shopping decisions explained by the model. A further limitation of our study was that we did not experimentally manipulate the behavioural change stages, even though they were used as a group variable (Bamberg, 2013b) in the regression models. Since people assigned themselves to the stages based on the answer to one question, we cannot guarantee that each participant was in the group to which they truly belonged. Such misassignments could be reflected in the unclear pattern in the socio-psychological variables. In a follow-up study, subjects could be assigned to the stages of the main study based on their actual behaviour (e.g., data from shopping diary study or an app that records purchases) or based on a pre-survey involving a purchase from the artificial online shop.

6 | IMPLICATIONS FOR RESEARCH AND PRACTICE

Measures are needed to effectively promote more sustainable customer behaviour. However, before such measures become reality, research is still required, and interventions that use phase-specific concepts need to be tested experimentally in the field (Gelino et al., 2021; Keller et al., 2021; Lange & Dewitte, 2019). While in our opinion there would be numerous opportunities to systematically test subtle measures in real-life settings with high external validity, unfortunately no real online store operators were willing to be partners for the experiment. Nevertheless, this study has provided new insights, even though certain online measures were only tested experimentally in a replicated online store. Therefore, it is our hope that these results will encourage other researchers to apply similar measures to investigate sustainable behaviour and we still strongly recommend seeking collaboration with practitioners to further prove the applicability of the phase models and provide effective interventions.

Notwithstanding some of the theoretical limitations already mentioned, in general, development of stage theory-driven measures and their implementation in the online shop were effective. However, a major obstacle to the stage-specific development of the treatments was that selecting the appropriate treatment for each stage was not straightforward, since theory describes a variety of influencing factors and therefore suggests a variety of treatments for each stage of the behavioural change process (cf. Ohnmacht et al., 2017). Thus, it would be interesting to test variations of individual measures per stage or to compare different theory-driven measures per stage (cf., Ohnmacht et al., 2017) in order to minimise the risk of null effects caused by a

specific treatment, as happened in our case. To align the interventions even more specifically to the phases, we believe a multi-stage project would be useful. This approach would require more effort to be devoted to qualitative pretesting, which would provide an even better basis for further testing and development of the interventions. Since our results refer to a sample of students at one point in time, it would be of additional benefit to observe a larger group of participants over a longer period of time to not only examine the factors that influence behavioural change, but also maintain the behaviour for different consumer types. In addition, it could provide more clarity on how long it takes to transition from one phase to another. This would complement the theory of phase models, as there is still little evidence or guidance on temporal aspects, such as how long it takes for an intervention to work or how long it takes a new habit to form. These temporal aspects could be investigated in more detail with long-term studies and would at the same time be valuable for companies and decision-makers.

Our results suggest that stage-specific interventions could also be useful for practitioners in the online food shopping context. As demonstrated by the tested interventions, online food shop providers could use relatively simple measures to encourage their users to buy more sustainable products. Even though the results show that additional information about motivation level is essential to inform users individually, this should not be an obstacle for companies. Realising that taking motivation level into account adds value to web store or website design, companies should use it in their analyses of customer behaviour data from web and mobile applications to create a holistic view of the user and the user experience that contributes to sustainable development.

A stage-specific approach is not an absolute guarantee of success, and from a practical point of view, stage-specific communication would require some effort. A simple but potentially effective first step could be to use feedback, as this led to an increase in eco-friendliness at three of the four stages. Since measures such as commitment devices require user activity and depending on the stage in the process, the use of social norms can backfire if they are not tailored correctly to the users' motivational state, more subtle measures that fundamentally simplify green shopping and at the same time provide more indirect information could be useful in practice. For example, an 'intelligent' shopping list application would be a possibility, where eco-friendly alternatives could be automatically suggested.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

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SUPPORTING INFORMATION

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