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PRACTICE INSIGHTS

Framing food waste: development and evaluation of a science communication format at the workplace

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Abstract

The mitigation of the climate crisis demands effective communication strategies. Transforming food systems plays a key role in climate protection, not only by changing eating habits, but also by preventing food waste. While workplaces are commonly used for health promotion activities, they are a rare setting for science communication. This practice insight targets individual food waste reduction through a workshop at the workplace, including a lunch from rescued food, documentary screening, discussion, and expert presentation. It aimed to enhance participants' self-efficacy and intention to reduce food waste. The effectiveness of the screening was tested experimentally by evaluating the effects of positive and negative framing. Exposure to negative framing was associated with higher intensity in negative affect, whereas positive framing appeared to be associated with higher self-efficacy. Furthermore, this practice insight provides strategies to foster science communication in workplaces.

Keywords

Bridging research, practice and teaching; Environmental communication; Public engagement with science and technology

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1 ▪ Introduction

In view of the ongoing climate crisis and its already noticeable consequences for environment and health, it is important to develop effective strategies for communicating climate change and possible countermeasures [Monroe et al., 2019]. The transformation of food systems plays a key role in climate protection and health prevention [Pörtner et al., 2022], especially since a third of all food is lost or wasted, resulting in various ecological, economic and social consequences [Forbes et al., 2024]. In Germany, private households are the largest contributors to food waste, accounting for 59% of German food wastage. This corresponds to 78 kg of food waste per person per year [BMEL, 2023].

Workplaces serve as strategic points for promoting nutritional health and sustainability through corporate health management [Mullane et al., 2019]. While existing studies address the attitude-related reasons for food waste in workplace canteens [Bell & Ulhas, 2020; Pires et al., 2022] and offer successful interventions against food waste in canteens [Jagau & Vyrastekova, 2017; Orr & Goossens, 2024], they highlight substantial research gaps in the field of communication science. Examples include identifying how to change individual motivations and consumer behaviour, improving the communication of anti-food waste campaigns, and developing (communication) strategies to counteract the identified barriers to reducing food waste. These studies conclude that companies and their employees are rarely addressed as a target group for science communication on climate change and health. However, the workplace is a popular setting to improve public health, for example by reducing sitting time among office workers [Ojo et al., 2019]. These health interventions are usually based on a psychological behaviour change theory which describes social/psychological mechanisms of how individuals change their behaviour, such as Bandura's [1989] social cognitive theory. Usually, these theories are oriented around how universal psychological concepts, such as attitudes, can be influenced so that they in turn lead an individual to adjust their behaviour [Kok et al., 2016]. Taxonomies such as Abraham and Michie [2008] or Kok et al. [2016], provide an overview and orientation for practitioners to select suitable behaviour change techniques for their intended purposes.

This practice insight uses evidence-based behaviour change theories/techniques and applies them to create a science communication format in the unconventional workplace setting. We describe the format's key elements, the recruitment process and present the results of an experimental evaluation design.

2 ▪ Underlying theoretical concepts

2.1 ▪ *Food waste communication format at the workplace*

Normative attitudes and self-efficacy are decisive factors in changing dietary habits for one's own health and to protect the environment and climate [Urbanovich & Bevan, 2020]. Therefore, we specifically designed a workshop at the workplace to enhance self-efficacy, i.e. the expectation and certainty to master a specific task or behaviour in the future [Bandura, 1989]. Self-efficacy can be fostered in a number of ways, the most common being the use of a *social group*, *empowerment/participation* of participants, *role models* and the *provision of knowledge*.

Social groups are considered an important basis for behaviour change, as pre-existing social groups that are perceived as supportive can increase an individual's motivation and power to change their behaviour [Laiou et al., 2020]. Our science communication format worked with pre-existing social groups at the workplace. The participants were all employees of the same employer, some of whom already knew each other.

Empowerment/participation within our context is defined as active involvement by applying the desired behaviour and the ability to influence valuable community changes. These experiences are particularly important for achieving long-term changes in self-efficacy and behaviour [Rogers & Singhal, 2003]. During the workshop, participants were asked to brainstorm about small changes they could make at home and at work to reduce food waste. Workplace representatives promised to encourage further discussion and implementation of these suggestions.

Role models are real-life examples of how the desired behaviour is expressed in reality. Effective role models encourage individuals to imitate their behaviour [Bandura, 1989]. Our format started with a catered lunch made from rescued food, with the researchers and the caterer acting as role models. Furthermore, the researchers filled storage containers with leftovers and encouraged participants to pack as many leftovers as they wanted.

Provision of knowledge is one of the most common techniques used in behaviour change and self-efficacy enhancement [Arlinghaus & Johnston, 2018]. The knowledge presented within the format was varied — we considered understanding the reasons why food waste is a global problem to be as impactful as practical tips on how to store food properly, plan accurate food portions and use leftovers [Le Borgne et al., 2021; Pearson et al., 2017].

2.2 ▪ *Emotional framing experiment in food waste communication*

Information about climate change has been shown to evoke a wide range of emotional responses [Nabi et al., 2018]. Emotions are understood as part of the wider concept of 'affect' [Niven, 2013]. Therefore, we define emotions as the aspects of positive or negative affect [Crawford & Henry, 2004]. In terms of reducing food waste, Sheen et al. [2020] suggest that eliciting negative emotions is more effective than positive emotions. In contrast, behaviour change interventions based on social cognitive theory focus on positive reinforcement [Bandura, 1989].

Positive or negative affect can be influenced by framing [DiRusso & Myrick, 2021; Gross & D'Ambrosio, 2004]. The act of framing a message is used to select and emphasise certain aspects of an issue, with the intention of influencing the way in which a particular piece of information is perceived and understood, in order to increase in its salience [Entman, 1993; Nabi et al., 2018]. Effective framing of documentaries aimed at reducing food waste has not yet been identified [Pearson et al., 2017].

To investigate whether positive or negative framing is more effective in generating (positive or negative) affects that ultimately influence self-efficacy and intention to reduce food waste, we included a framing experiment in the workshop. Both groups were shown a 5-minute documentary excerpt from an existing science communication programme by a regional public broadcaster [WDR, 2020] — see Figure 1. The film excerpts in both groups started with a rather neutral explanation of how food waste contributes to climate change (2 min).

Figure 1. Documentary excerpt screening with negative framing (Group A).

The remaining 3 minutes varied between the groups (experimental aspect). Group A's excerpt (negatively framed) emphasised the wider social, environmental and economic consequences of food waste as a society and included a negative portrayal of German legislation banning dumpster diving. The positively framed excerpt (Group B) emphasised practical tips and reasons for avoiding food waste in private and societal contexts.

Because of the potential effects of framing on affect [DiRusso & Myrick, 2021], we hypothesise that different framings (independent variable (green), Figure 2) are likely to elicit different emotions (mediators (yellow), Figure 2):

- H1.1: Those in Group A (negative framing) report a higher intensity of negative affect than those in Group B (positive framing).
- H1.2: Those in Group B (positive framing) report a higher intensity of positive affect than those in Group A (negative framing).

Previous research [Bandura, 1989; Sheen et al., 2020] shows that affects (mediators (yellow), Figure 2) can influence self-efficacy and intention to reduce food waste (dependent variable, main outcomes (pink), Figure 2). This leads us to the following hypotheses:

- H2.1: Negative affect is negatively associated with self-efficacy and intention to reduce food waste (T1).
- H2.2 Positive affect is positively associated with self-efficacy and intention to reduce food waste (T1).

We also wanted to explore whether self-efficacy and intention to reduce food waste changed over time as a result of the different framings.

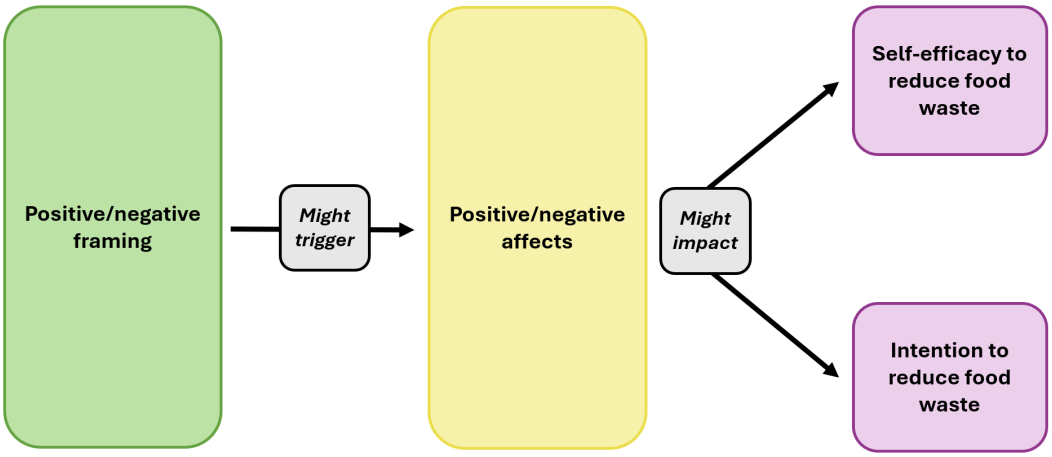

Figure 2. Visualisation of the suspected effects within the framing experiment; independent variables (green): positive or negative framing; mediators (yellow): evoked positive/negative affects; dependent variables/main outcomes (pink): self-efficacy and intention to reduce food waste.

- H3.1: Self-efficacy and intention to reduce food waste decrease over time (T0–T2) in Group A (negative framing).
- H3.2 Self-efficacy and intention to reduce food waste increase over time (T0–T2) in Group B (positive framing).

3 ▪ Methods

3.1 ▪ *Description and design of the science communication format*

To address the issue of household food waste, we — an interdisciplinary group of health, social, sustainability and communication researchers — developed a workshop consisting of a communal lunch made from rescued food, followed by a short film screening, a discussion and an interactive expert presentation (see Table 1).

3.2 ▪ *Target group and recruitment*

While some companies engage extensively in sustainable management, it is also important to consider companies that do not prioritise this area. Therefore, the workshop was targeted at professionals from i) medium-sized and large companies, ii) located in the area of Munich, Germany, iii) outside the sustainability and food sector, and iv) able to recruit at least 30 employees. Emails promoting the workshop were sent to the health/sustainability/HR departments of potential collaborating companies. If they were interested in participating, we provided additional information.

We contacted 33 companies and eventually ran two iterations of the workshop (Group A in April 2023, Group B in September 2023) in collaboration with a German communications services company. Common reasons for refusal by other companies included administrative hurdles, such as difficulty in scheduling a suitable date (as such events are usually planned several months in advance) or the need for prior approval from the works council. Another challenge was identifying the right contact person and our requirement to allow

Table 1. Design of the science communication format and the evaluation of the framing experiment.

Workshop element	*Evaluation of framing experiment*
	T0 survey: Questionnaire (online or paper & pencil)
Lunch made from rescued food items (45 min)	
Documentary excerpt screening (5 min)	Framing experiment – Negative framing (Group A) – Positive framing (Group B)
	T1 survey: Questionnaire (online or paper & pencil)
Discussion about excerpt screening (15 min)	
Interactive expert presentation: practical tips to reduce food waste at home and at the workplace (30 min)	
	T2 survey (3-months follow-up): Questionnaire (online or paper & pencil)

30 employees to attend the workshop at the same time. While we were successful in recruiting the required number of participants for Group A, Group B consisted of only 10 employees due to last-minute cancellations and conflicting commitments. Effective recruitment strategies included the use of personal contacts, identifying relevant individuals via LinkedIn, and calling relevant company departments via phone. In contrast, enquiries sent to standard email addresses were rarely responded to.

3.3 ▪ *Framing experiment*

To analyse the effectiveness of strategic science communication (i.e. the achievement of pre-defined communication goals), evaluation is an integral part [Volk & Schäfer, 2024; Ziegler et al., 2021]. Due to limited personal and participant time resources to deliver an appealing workshop, we focused on evaluating the documentary screening framing experiment. Our evaluation focused primarily on assessing self-efficacy and intention to reduce food waste as equivalent outcomes, as both are considered important aspects of changing food wasting behaviour. However, we did not assess the relationship between self-efficacy and intention to reduce food waste, as this has been suggested to be influenced by various other aspects [Ding, 2022; Kim et al., 2022; Visschers et al., 2016], which we were unable to assess.

3.4 ▪ *Data collection*

The framing experiment followed the outline shown in Table 1. One week before the workshop, the T0 baseline questionnaire was sent to participants via email. Participants were also given the opportunity to complete the baseline questionnaire (online or paper and pencil) over lunch on the day of the workshop. Immediately after the documentary screening, participants completed the second questionnaire (T1). T2 was sent out as a 3-month follow-up questionnaire looking at longer-term effects.

Quantitative data was collected via online questionnaires, using the Impact Unit's tool for evaluating science communication (https://evaluationsplattform.impactunit.de/). The

concepts assessed at all three time points were self-efficacy to reduce food waste (2 items [Kim et al., 2022]), and intention to reduce food waste (2 items [Visschers et al., 2016]). Participants' affect at T1 (immediately after the documentary screening) was assessed using the Positive and Negative Affect Schedule (PANAS); namely 5 positive (strong, interested, elated, determined, enthusiastic) and 5 negative (shocked, guilty, angry, ashamed, frightened) aspects [Crawford & Henry, 2004]. The covariates assessed were age, gender and education [Visschers et al., 2016] and sustainable consumption (3 items [Balderjahn et al., 2013]). We controlled for these covariates and report the adjusted results. The concepts of self-efficacy, intention to reduce food waste, affect and sustainable consumption were assessed using 5-point Likert scales, ranging from 1 = 'strongly disagree' to 5 = 'strongly agree'. All scales were translated into German by native speakers using standard translation procedures.

3.5 ▪ *Data analysis*

Data were analysed in R-Studio (R version 4.3.0) using 2-sample t-tests (H1.1, H1.2), multiple linear regressions (H2.1, H2.2), mixed 2-way ANOVAs and paired t-tests (H3.1, H3.2), as well as descriptive statistics.

4 ▪ Results

Baseline characteristics of our participants (N = 40; see Table 2), show that mainly female employees (n = 30) were attracted to attend the workshop. Participants were also generally younger (18–35 years old; 85%) and highly educated (university degree; 80%). Self-efficacy to reduce food waste (2 items) and intention to reduce food waste (2 items, combined into one) appeared to be relatively high at baseline (self-efficacy 1: M = 4.03; self-efficacy 2: M = 4.33; intention to reduce food waste: M = 4.24). The three dimensions of sustainable consumption were heterogeneous, with environmental sustainability (M = 2.95) and social sustainability (M = 3.03) relatively low, whereas economic sustainability seemed more established (M = 4.13).

Reported emotions varied considerably between the two groups. The results of the 2-sample t-tests support the hypothesis, that the negative framing evoked more intense negative aspects of affect than the positive framing (H1.1). Group A (negative framing) reported significantly more negative affect (p = .003 CI: 0.35–1.48; Cohen's D: large effect, 1.14 CI: 0.39–1.90). Of the five PANAS aspects of negative affect, participants reported significantly higher intensities of being frightened (p = .048 CI: 0.01–1.30; Cohen's D: medium effect, 0.55 CI: -0.17–1.27) and shocked (p = .004 CI: 0.63–2.69; Cohen's D: large effect, 1.28 CI: 0.50–2.04). We must reject our hypothesis that those who experienced the positive framing would also report a higher intensity of positive affect (H1.2). The mean of positive affect was lower in Group A (negative framing), but not statistically significant. However, of the five PANAS aspects of positive affect, those in Group A (negative framing) felt significantly less elated (p = .03 CI: -1.95–-0.11; Cohen's D: large effect, -0.96 CI: -1.72–0.21) and enthusiastic (p = .013 CI: -1.92–-0.26; Cohen's D: large effect, -0.88 CI: -1.62–0.14).

Figure 3 illustrates the differences in reported mean positive/negative affect between the two groups. A detailed report of our results can be found in Tables S1–S2 (Supplementary material).

Table 2. Baseline characteristics (T0).

	Negative framing (n = 30)	*Positive framing* (n = 10)	*Overall* (N = 40)
Gender			
Female	22 (73.3%)	8 (80.0%)	30 (75.0%)
Male	8 (26.7%)	2 (20.0%)	10 (25.0%)
Age group			
18–35 years	24 (80.0%)	10 (100%)	34 (85.0%)
36–50 years	4 (13.3%)	0 (0%)	4 (10.0%)
50+ years	2 (6.7%)	0 (0%)	2 (5.0%)
Education			
General education school leaving certificate	0 (0%)	0 (0%)	0 (0%)
General higher education entrance qualification	6 (20.0%)	0 (0%)	6 (15.0%)
Vocational education and training	2 (6.7%)	0 (0%)	2 (5.0%)
University degree	22 (73.3%)	10 (100%)	32 (80.0%)
Self-efficacy 1 — individual actions matter*			
Mean (SD)	3.97 (0.93)	4.20 (0.92)	4.03 (0.92)
Median (Min, Max)	4.00 (2.00, 5.00)	4.00 (2.00, 5.00)	4.00 (2.00, 5.00)
Self-efficacy 2 — changes daily routines*			
Mean (SD)	4.30 (0.65)	4.40 (0.70)	4.33 (0.66)
Median (Min, Max)	4.00 (3.00, 5.00)	4.50 (3.00, 5.00)	4.00 (3.00, 5.00)
Intention to reduce food waste (mean)*			
Mean (SD)	4.13 (0.94)	4.55 (0.55)	4.24 (0.87)
Median (Min, Max)	4.50 (2.00, 5.00)	4.75 (3.50, 5.00)	4.50 (2.00, 5.00)
Sustainability 1 — environmental*			
Mean (SD)	2.90 (0.88)	3.10 (1.10)	2.95 (0.93)
Median (Min, Max)	3.00 (2.00, 4.00)	3.00 (2.00, 5.00)	3.00 (2.00, 5.00)
Sustainability 2 — social*			
Mean (SD)	2.97 (0.89)	3.20 (1.23)	3.03 (0.97)
Median (Min, Max)	3.00 (2.00, 4.00)	3.50 (1.00, 5.00)	3.00 (1.00, 5.00)
Sustainability 3 — economic*			
Mean (SD)	4.03 (1.03)	4.40 (0.70)	4.13 (0.97)
Median (Min, Max)	4.00 (2.00, 5.00)	4.50 (3.00, 5.00)	4.00 (2.00, 5.00)

* 5-Point Likert Scale: 1 = strongly disagree. 5 = strongly agree.

Concerning the immediate effects of these evoked affects, we can partially support hypothesis H2.1. Multiple linear regression revealed a negative association between high negative affect intensity and one of the two self-efficacy items (p = .01 CI: -0.74–-0.11). Positive affect was positively associated with both self-efficacy items (p = .004 CI: 0.25–1.19; p = .003 CI: 0.17–0.8), leading us to partially support hypothesis H2.2. However, reported affects were not associated with a statistically significant change in intention to reduce food waste.

To assess the effect of the overall variation in framing, we performed a two-way mixed ANOVA for those who completed all three questionnaires (T0 & T1 & T2) (n = 21). For those who only

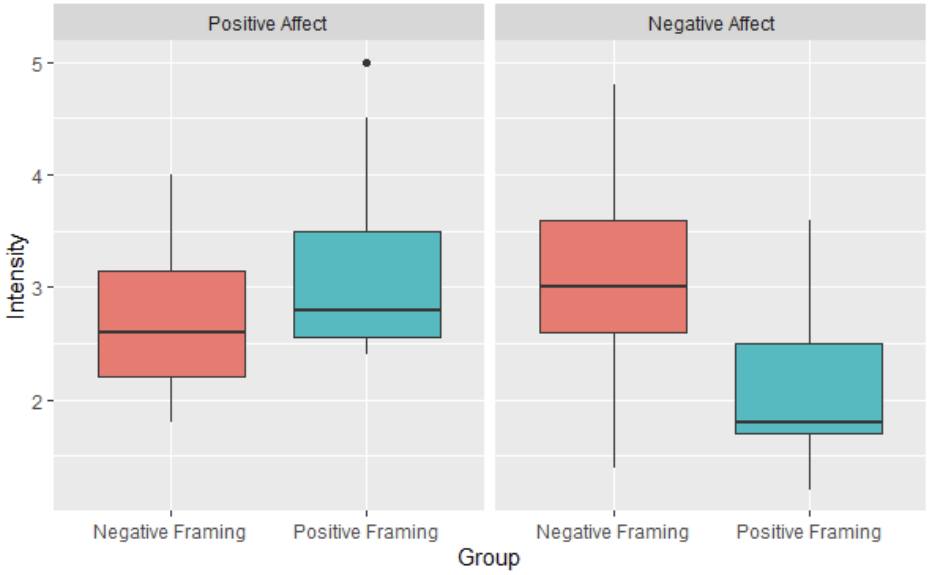

Figure 3. Mean of positive/negative affect after the negatively/positively framed film excerpts, rating based on a 5-point Likert-scale from 1 = "strongly disagree" to 5 = "strongly agree".

completed the baseline and workshop questionnaires (T0 & T1), we performed paired t-tests to assess any short-term changes. Both, the two-way mixed ANOVA and the paired t-tests were not statistically significant, therefore we cannot support hypotheses H3.1 and H3.2 that the variation in framing has longer-term effects on self-efficacy and intention to reduce food waste.

5 ▪ Discussion

5.1 ▪ *Participants' characteristics, recruitment and selection bias*

Participants reported a high self-efficacy and intention to reduce food waste at baseline. These observations are not surprising, as being female is associated with lower food wasting behaviour, but older age may be associated with higher intention to reduce food waste [Visschers et al., 2016]. However, the role of age and generational differences in sustainability attitudes is still debated [Acar Tek et al., 2023; Bulut et al., 2017; Prayag et al., 2022]. Recruiting companies within the targeted timeframe proved to be difficult, as mainly companies in the sustainability and/or food sectors were interested in participating. Where companies outside these sectors were interested, it was mainly staff from their sustainability team who signed up, or interested companies were unable to recruit the minimum of 30 participants. These experiences are consistent with the findings of Mullane and colleagues [2019], that flexibility and careful planning are crucial when enrolling workplaces for health interventions. Therefore, our findings must be viewed with a potential selection bias in mind and cannot be generalised to less interested and informed populations.

5.2 ▪ *Effects of the positively/negatively framed documentary excerpts*

Our results imply the importance of emotions in short-term self-efficacy to reduce food waste and how different framings may evoke these affects, as those in Group A reported a

higher intensity of negative affect, particularly fear and shock. Positive affect was associated with an increase in self-efficacy. These findings are similar to those of Burić et al. [2020], who found that negative emotions were associated with lower self-efficacy, whereas positive emotions were associated with higher self-efficacy in teachers. However, a long-term prediction based on these emotions was not always accurate. Our results are broadly consistent with Sheen et al. [2020], who report that public campaigns evoking concern and worry have mixed success in changing participants' attitudes towards reducing food waste. In addition, Jagau and Vyrastekova [2017] found that a negatively framed information campaign that induced guilt and shame was more effective in reducing food waste among restaurant customers when they could easily ask for a smaller portion.

Changes in self-efficacy and intention to reduce food waste due to group allocation were not statistically significant, which is not surprising given the small sample sizes in both groups and the already high levels of self-efficacy and intention to reduce food waste at baseline. Possible influences of economic sustainability on the intention to reduce food waste at T0 and T1 suggest another strategy to encourage a food waste reduction: less food waste means more money available for other spendings. However, the overall influences on self-efficacy and intention to reduce food waste should be evaluated in further studies with larger sample sizes, as our results imply some effects.

6 · Further strengths and limitations

Our workshop focused on changing participants' self-efficacy and intention to reduce food waste, but we did not assess actual changes in food waste behaviour. As discussed above, our statistical power is insufficient to report reliable effects. In addition, the lack of control groups means that we cannot estimate the effect of the screening itself. Selection bias among our participants could not be completely ruled out, as participation was voluntary and advertising materials were also modified by the recruiting parties within the company. We cannot guarantee the avoidance of spillover effects, as both workshops took place in the same company, and not at the same time, but five months apart. Changes in external factors during this period could also have influenced the results.

Nevertheless, we tried to reduce the effects of bias by carefully selecting the participating company and by choosing a rather unusual target group. Another strength of the experiment is the quantitative questionnaire design, consisting of validated scales, particularly the administration of T1 immediately after the screening, which prevented recall bias. To our knowledge, this is the first workshop to address effective science communication for food waste reduction in collaboration with business. We identified possible influences of positive and negative affect on self-efficacy and intention to reduce food waste. These need to be further investigated in future studies, with an emphasis on larger sample sizes and possibly adding a qualitative component, e.g. systematic observation.

However, the focus of this practice insight on changing individual self-efficacy and intention to reduce food waste contrasts with the general critique of behaviour change ambitions in relation to food waste/climate change. Not only is the responsibility for food waste and climate change shifted towards consumers [Döbbe & Cederberg, 2024; Thompson & Kumar, 2018], but also the societal dimension, i.e. social norms, political and legal circumstances, is hardly addressed, despite its importance for long-term change [Shove, 2010]. In light of this,

similar science communication efforts must always be accompanied by structural approaches, such as offering smaller portions in the cafeteria or destigmatising the consumption of rescued food by establishing food-sharing events.

7 ▪ Conclusion

Workplace health management initiatives can serve as strategic points for promoting healthy and sustainable behaviours. This practice insight presents an innovative science communication format to promote self-efficacy and intention to reduce food waste, drawing on social structures within the workplace setting. Companies and businesses, due to their high level of organisation, offer structured access to target groups and provide a promising setting for science communication that has been little explored. A remaining obstacle is to convince companies that such workshops offer added value for the company and its employees, especially if they are not directly related to the company's purpose and go beyond technology transfer. It could therefore be beneficial to discuss ways of embedding the workshop topic into companies' ESG (Environmental, Social, Governance) strategy, including regular reporting and accountability at senior management level. Engaging with on-site facilities, such as workplace cafeterias, to implement structural changes could reinforce food-saving behaviour in the long term.

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Declarations

Ethics. This research received ethics approval from the Institutional Review Board at the Department of Media and Communication (IfKW) at LMU Munich (reference no. 2023-06).

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Conflicts of interests. The authors declare no conflicts of interests.

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