Federal Agency for Nature Conservation

The puzzle of transformation

Impulses from environmental psychological research

Gerhard Reese, Anne-Kristin Römpke, Asja Bernd,
Christoph Dolderer and Andreas W. Mues (Eds.)

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Imprint

Cover picture: Melita – stock.adobe.com (Many hands are reaching from the outside into the picture forming a circle. They are all holding pieces of a jigsaw puzzle.)

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1 Editorial: Environmental Psychology – a disciplinary and interdisciplinary agenda for socio-ecological change

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The "Environmental Psychology Summerschool on Vilm Island" 2021 was characterized by not being conducted on Vilm Island. Neither was it conducted anywhere in person. It was a fully digital Summerschool and this was challenging maybe even more so than travelling to Vilm Island by bike, train, foot and ferry. Nevertheless, the Summerschool 2021 was a success again, we brought together eminent speakers from various backgrounds in Environmental Psychology and adjacent fields with young research talents who presented and discussed their work to a scientific audience. The third installment of the Summerschool conducted in the midst of the corona pandemic thus was an important piece of scientific collaboration at times where especially junior scholars have a hard time building their scientific networks. We hope, although the meeting was virtual, that we could at least contribute to a feeling of collective efficacy, such that we as environmental psychologists have some answers to large questions of our time.

In this chapter, we briefly review some of the work presented at Virtual Vilm. Before, however, we want to provide to the interested reader a brief summary of what environmental psychology is, and how it can be positioned in a growing sustainability science.

1.1 Environmental psychology

The field of environmental psychology has gained tremendous momentum over the last years, with more and more people realizing that we as humans are responsible for global environmental change while at the same time failing to do something against it. Reports on climate change and other anthropogenically caused geophysical changes (for an overview, see Steffen et al., 2015) yet fail to motivate coordinated and efficient action. There are many reasons for this apparent apathy, but the behavioral aspects of climate mitigation and adaptation, for example, have long be neglected. Over the past decades, talented scientists and engineers managed to provide technological solutions that could have brought transformation forward, but such solutions did not really result in reduced emissions. Of course, wind and solar farming are the most important parts when it comes to the transformation of the energy supply system. However, efficient engines, LED lighting and screens, or electric cars are useless (at least for the climate) if we as citizens, consumers and users hold fast to our beloved routines and decisions. Car engines have never been as efficient as today, yet they have to move cars that weigh twice as much as cars 30 years ago. Similarly, LED lightning is more efficient than the old light bulb, and LED screens are more efficient than the old CRT screens. However, many households in rich countries now have a dozen screens (Tablets, Laptops, TVs, Smartphones) rather than one CRT TV and maybe one CRT computer screen. At the same time, we tend to forget that light could be switched off, resulting in longer burning times of the LED, thus consuming the alleged savings. And individual mobility in an electric car although locally emission free still promises a lot of

microplastic (from the tyres), emissions (in production and if run on fossil fuelled electricity) and wasted time. A traffic jam in an electric car still is: a traffic jam.

At this point, environmental psychologists come into play. Environmental psychology as we understand it deals with the impact of the both natural and built environment on the human psyche and human behavior and vice versa. That is, environmental psychologists seek to understand how our human behavior affects the environment. So, on a very basic level, environmental psychology can be defined as the subdiscipline of psychology that deals with human environment interactions. As such, it is a research field that depends strongly on the input of other disciplines and policy decisions, making it an inter and transdisciplinary endeavor. In other words: It does justice to the idea that our thoughts and actions are shaped by the societies and socio-technological regimes we are embedded in (see below).

More specifically, environmental psychology deals with a variety of research topics concerning the natural but also built environments and their interaction with human beings. Without foreclosing too much of the contributions compiled in this issue, it is evident that environmental psychology research can inform us about the catalysts and barriers that prevent and enable proenvironmental behavior. Over the past decades, a number of theoretical and empirical models were designed that took into account the human psyche in response to the environmental crises, revealing the role of psychological concepts such as attitudes, norms, behavioral control, efficacy but also political ideology, moral values, routines, just to name a few (for a detailed overview of such variables, see for example Bamberg & Möser, 2007). More recently, researches began acknowledging that beyond such individualistic variables, models of collective behavior need to be taken into account when it comes to the appraisal of and response to environmental problems (Hornsey & Fielding, 2016; Fritsche, Barth, Jugert, Masson & Reese, 2018).

Yet, it is evident that psychological concepts and processes alone will not suffice to combat climate change and environmental problems in general. Environmental psychology is by definition concerned with environmental issues, which, in turn, are multidisciplinary determined. Technological innovations as well as policy making and infrastructural capacities influence people's environmental appraisals and responses so that these have to be taken into account. For example, policyinduced fees for plastic bags can reduce plastic bag use drastically (as shown in Ireland) and providing and supporting use of alternative energies can increase their acceptance. Thus, it is one task of environmental psychologists to show how and under which conditions humans act proenvironmentally within their meso and macrostructures. We think that one fruitful path to do so is to position psychology within a multilevel perspective, as the one proposed by Geels (2004; Geels and Schot; 2007). The multilevel perspective suggests that a system determining societal functioning comprises three levels. The central level is called the socio-technological regime. The regime consists of current institutions (e.g., governmental agencies, ministries), infrastructures (e.g., motorways, airports), technologies (e.g., engine technologies), and policies (e.g., regulations regarding carbon pricing), but also normative behavioural practices (e.g., frequent flying). The regime is embedded in the landscape, which consists of "the technical, physical and material backdrop that sustains society" (Geels & Schot, 2007, p. 403), such as the climatic conditions or the availability of fossil resources. While the regime and landscape levels are seen as rather stable, they can be actively changed by the third central level the niche level. New technologies, behavioural practices, and ideas for policy change can evolve on the level of

niches. Here, networks of individuals emerge, who promote societal change through changing their own behaviour or through supporting political change. Fridays for future as a case in point can be seen as an element within such a niche a network of primarily young people who promote a fierce change to a decarbonized system. This network, again, has sparked additional change in other niches: As a consequence of Fridays for future, other groups have evolved (e.g., psychologists for future, farmers for future, economists for future, to name but a few) that affected the system, up to the point that these changes in the niche have affected changes in the regime. In Germany, for example, the Fridays for future movement has at least contributed to a stronger public and policy debate regarding climate. This brief example illustrates the "power of we". Once we act in concert with other like-minded people, societal change is possible.

1.2 Contributions of this issue

The work that is compiled in this issue shows how passionate and professional young scholars contribute to the research body in environmental psychology. While the work compiled for this issue represents several different approaches to understanding environmental behavior, they all address and identify its underlying processes. In the following, the contributions will briefly be summarized, following the order in this issue.

In the first contribution, Grelle and colleagues argue that more and more environmental policies make use of behavioural insights – for example, by applying relatively subtle but powerful behavioral interventions designed to steer people to the environmentally friendlier decisions (so called green nudges). This requires an understanding of how such nudges work, and when they find acceptance in the public. In their project, Grelle and colleagues study whether green nudges are more endorsed by the public when they are societally framed compared to personally framed. Preliminary results of an online study suggest strong public acceptance of green nudges across different decision-making contexts regardless of how the nudges were framed. The authors provide conclusions for policymaking about the implementation and use of nudges to promote behavioral change towards environmental protection.

In the second contribution of this volume, Hahn & Walther set out from the thought that people consume although they would like to avoid certain problematic behaviors. Very often, due to convenience, taste, or the lack of alternatives, people tend to remain in routined actions although they know better. This experience of ambivalence, according to the authors, might help to explain why people are often hesitant to get rid of environmentally harmful behaviors. As Hahn and Walther suggest, changing ambivalent evaluations into univalent negative evaluations might thus be a good starting point for interventions. In their chapter, the authors review the effect of one-sided (only positive vs. only negative) information interventions on plastic-related ambivalence. Using an intriguing MouseTracker paradigm, they found that participants showed greater ambivalence toward plastic packed food than unpacked food. This ambivalence, however, was not affected by a one-sided information intervention. Plastic use and reduction are discussed.

The contribution by Zwicker and colleagues investigated participants' attitudes towards fossil based and bio-based plastic, their perceived importance of recycling both types of plastic, their willingness to pay, and their perceptions of bio-based plastic in four studies, including an experimentally manipulated information about bio-based plastic and measured willingness to pay for

different types of plastic. Findings of their studies suggest that overall, participants hold very favourable attitudes and are willing to pay more for bio-based products. At the same time, the authors found that participants also held various misconceptions about bio-based plastic, especially with regard to its biodegradability. Educating consumers about the properties of bio-based plastic can dispel misconceptions and retain a favourable attitude and a high willingness to pay. Towards the end of their chapter, the authors discuss how attitudes and misconceptions affect the uptake of new sustainable technologies such as bio-based plastic and consumers' willingness to purchase them.

In the fourth contribution, Krumm argues that a substantial change towards more pro-environmental behavior (PEB) is important to reach the required reduction in greenhouse gas emissions and mitigate climate change. She discusses that one path to motivate such pro-environmental actions it to keep the consequences and expectations about individual well-being in mind. Specifically, she focuses on the potential paradox that while PEBs are often framed as a sacrifice and costly in the public, research regularly reports positive correlations between PEB and well-being.

Kukowski and colleagues work is presented in the fifth contribution of this volume. Their work deals with "behavioral public policy" – a field of research that refers to interventions aimed at steering people's behavior toward broader goals like climate protection. Such policies can play an essential role in creating necessary individual behavior change. Here, the authors describe and propose an extension to extant perspectives, taking a social-motivational approach to understanding public support for behavioral climate policy. They outline how characteristics of people and their social surroundings shape policy support, followed by a description of their empirical work showing how people's own motivations, as well as their perception of others' environmental behavior, influence whether they support policy to address climate change. Based on these findings, the authors make suggestions for climate policy framing and communication.

In the final contribution, Treek and colleagues focus on the key role of negotiation processes to mitigate sustainability challenges and promote intergenerational welfare. Specifically, the authors argue that research and practical intervention approaches assessing such negotiation processes are much needed. Therefore, they first illustrate the significance of present joint decision-making for future generations with the example of a recent constitutional court decision. Subsequently, they provide a brief overview of current research on the integration of future generations' interests in the fields of individual and joint decision-making. Concluding with the identification of major barriers toward the integration of future generations' inter-ests in today's joint decision-making, the authors discuss the relevance of their and potential future work.

1.3 The future of environmental psychology

The work in this issue gives hope with respect to three core points. First of all, environmental psychology acknowledges that climate change and virtually all other environmental degradation problems are human made – and could thus be dealt with by collective human efforts. Second, environmental psychology research is characterized by such collective efforts: As the research presented in this issue and previous issues of the BfN-Skripten shows, a growing number of researchers collaborate with the goal to understand human behavior vis-á-vis the (natural) environment, providing explanations for why and why humans do (not) act in favor of the

environment. And third, as the previous chapter and the remainder of this issue shows, environmental psychology itself is facing a bright future. In recent years, the field has attracted more and more students and young scholars who became active in investigating antecedents and consequences of environmental behavior. What's more, the field becomes increasingly internationalized, and its research is often placed both in high-impact psychological and interdisciplinary journals but also in more publicly popular outlets. The media have become aware of environmental psychologists' work alike, giving "us" the opportunity to show the public how environmental action – be it pro- or contra-environmental – is shaped psychologically.

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2 When do people accept green nudge interventions?

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Abstract

Climate change poses one of the greatest societal and political challenges of our time demanding large-scale behavior change. Environmental policies are increasingly informed by behavioral insights, including green nudges – relatively subtle but powerful behavioral interventions designed to steer people to the environmentally friendlier decisions. Whether a certain behavioral intervention succeeds in prompting behavior change depends crucially on the willingness of the public to endorse that policy. We investigate when people accept green nudges and when they do not. Research has shown that the way public policies are framed, if they address people in general (societal framing) or the individual (personal framing), makes a difference. In this project, we study whether green nudges are more endorsed by the public when they are societally framed compared to personally framed. We further investigate the role of the perceived effort people associate with the nudged behavior change (e.g. reducing meat or plastic consumption) in green nudging acceptance. Preliminary results of an online study point to a general high public acceptance of green nudges across different decision-making contexts that is independent of the nudges' framing. Green nudges were more accepted by participants when they perceived the nudged behavior as rather low effort, non-intrusive for their everyday life and effective in protecting the environment. Lastly, we draw conclusions for policymaking about the implementation and use of nudges to pro-mote behavioral change towards environmental protection.

2.1 What is holding us back from making greener choices? And what can('t) green nudges do?

Despite good intentions to eat less meat, buy fewer plastic products and use the bicycle more often instead of the car to get to work, we often fail. Why is it that we keep making decisions that harm our environment, even though we care about climate change and its consequences for humankind? Scientists from the discipline of behavioral economics conclude that human rationality and willpower are bounded (Simon, 1972; Kahneman, 2003). Especially in stressful situations, we struggle to maintain self-control and tend to follow rather automatic responses instead of reflecting thoroughly on which is the better (e.g. more sustainable) decision (see the heuristics and biases program by Tversky and Kahneman (1974) and the Dual Process Theory by Kahneman (2011)). Then, it may happen that we throw our rubbish into the wrong bin, forget to tick the box for double-sided printing, reach for the car key as soon as it starts drizzling and in general consume more plastic, water and energy than we need.

Importantly, we do not make decisions in an empty space, but our decisions are constantly influenced consciously as well as unconsciously by the environment we are acting in the so-called choice architecture (Thaler & Sunstein, 2008). For example, it is more difficult for us to refrain from eating meat in canteens when we have to explicitly ask for a vegetarian alternative or to

take the bicycle if the infrastructure is lacking and generally designed for motorized traffic. The choice architecture can be designed in such a way that it is easier for us to make environmentally friendly decisions (e.g. when vegetarian meals are offered by default or when bicycle lanes are prominently painted as such). Nudges are subtle yet powerful micro interventions that make use of behavioral insights to steer people towards the right decisions. Thaler and Sunstein define nudges in their identically titled book as "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives" (Thaler & Sunstein, 2008, p. 6). A nudge should neither restrict choice options nor impose a particular outcome on the individual, a philosophy the two researchers call "libertarian paternalism". Policy makers have recognized the value of implementing nudges in their toolbox of public policies besides incentives, regulations and educational campaigns to elicit public behavioral change. Popular examples of nudges designed to promote environmentally friendly behavior – so-called green nudges – are colorful footprints on the ground directing to public trash cans, informing citizens about their electricity consumption compared to their neighbor or putting the more sustainable food options right at the beginning of a buffet.

2.2 Nudging acceptance

For every public policy, including green nudges, to be successful in promoting behavior change, the question of whether the target person accepts the policy plays a major role. Policy acceptance is essential to strengthen peoples' motivation to engage in the nudged behavior, despite unpleasant costs (e.g. restriction of freedom or high effort behavior) and to prevent strong negative reactions such as protests, so-called reactance effects (Brehm & Brehm, 2013). Measuring the acceptance of a nudge that is (planned to be) introduced by the government further gives important feedback on whether the nudge corresponds to the values and norms of the target group. When people feel threatened in their autonomy by the implementation of a nudge or believe that its intended goal does not fit their values, they are more likely to oppose the nudge (e.g. Reisch & Sunstein, 2016; Sunstein et al., 2019). Investigating nudging acceptance is important not only as it serves as an indicator for the public's compliance with the nudged behavior change, but also to ensure it is in accordance with societal values. This project contributes to clarifying when people accept green nudge interventions and when they do not.

2.3 The role of framing and perceived effort in green nudging acceptance

Besides the accordance to societal values, the context and framing further determine how the message is perceived (Tversky & Kahneman, 1981). We assume one crucial answer to the question of when people accept green nudge interventions is "when it's not in their backyard" (NIMBYism). NIMBYism describes the phenomenon when people are supporting a new project (here an intervention promoting protection of the environment) but raise objections when it is too close to where they live or would disturb them in some way. Literature indicates that the way public interventions are framed, if they address you, or them makes a difference for their acceptance ratings.

For example, Cornwell and Krantz (2014) showed that phrasing the justification for public interventions including incentives and nudges either by directly addressing the individual ("you") or more generally the society ("them") does affect their acceptance. They further found this effect to be mediated by beliefs about the likelihood of the policy's success. The researchers explain

these results with the third person effect coined by the sociologist Davison (1983) showing that people, when exposed to a certain message, believe others to be more influenced by the message than they themselves. In this regard, Cornwell and Krantz (2014) conclude from their findings that people support societally (vs. personally) framed nudges more because they consider them to be more effective for others than for themselves. In an empirical study by Jung and Mellers (2016) investigating nudging acceptance in an American sample, they found interactions with empathetic people accepting societally framed nudges more and reactant people rejecting nudges more when the personal costs of nudge rejection were emphasized. However, the researchers could not find a main effect of framing on nudging acceptance.

To our knowledge, there is limited empirical research done investigating the effect of personally vs. societally framed nudges on their acceptance for different environmental decision-making contexts. Tackling this gap, we aim at clarifying the impact of the nudges' framing on green nudging acceptance. We further believe that the perceived effort to change the behavior into the nudged direction plays a crucial role for their acceptance. For example, a study by Sunstein and colleagues (2019) revealed that nudges received less approval by individuals who were enjoying and engaging in the behaviors the nudges promote to change. Here, the effort attached to the behavior change is obviously higher compared to stopping a less enjoyable behavior. According to the idea of NIMBYism, we assume that people would support nudges promoting environmental protection in general (societally framed nudges), however, to a lesser extent when those nudges get "too close", hence, when the promoted behavior change is highlighted for the individual (personally framed nudges) and perceived as rather effortful for the nudged person.

2.4 Testing green nudging acceptance and the role of nudge framing and perceived effort

To test the role of the nudges' framing and perceived effort for their acceptance, we designed an online survey with different statements representing three popular nudge types (defaults, social comparison, feedback) in five different environmental decision-making contexts that are assumed to be relevant for greenhouse gas emissions (energy consumption, meat consumption, car use, travelling by plane, plastic consumption). For each environmental decision-making context, participants were asked to rate the extent to which they find a behavior change effortful and they perceive a societal problem. The nudges were presented to the participants either personally framed (addressing "you") or societally framed (addressing "them"). In each framing group, for each presented green nudge intervention, participants were asked to estimate their acceptance. Demographics, political orientation and perceived effectiveness and intrusiveness of the nudges were further assessed.

2.5 Results in a nutshell

Preliminary multilevel analyses indicate that citizens generally endorse the implementation of green nudges to reduce greenhouse emission rates. These results hold true independently of the two framing conditions, so that acceptance does not vary depending on whether the nudge addresses the individual or people in general. Acceptance ratings were especially high for nudges promoting behavior change in the domain of plastic and energy consumption, followed by travelling by plane and car use. Nudges promoting the reduction of meat consumption were least accepted. Results further reveal that the higher the perceived effort attached to a certain

behavior elicited by a green nudge, the lower the acceptance of the nudge in that domain. Interestingly, highest effort ratings were indicated for behavior change with respect to energy consumption, followed by meat consumption, car driving and plastic consumption. Reducing plane travels is associated with lowest effort ratings. Finally, the less a nudge was perceived as intervening with people's everyday decision-making and the more a nudge was perceived as effective in protecting the environment, the stronger they were approved.

It is important to note that the distribution of political orientation in our sample displays significantly more left-wing oriented than right-wing oriented participants, which is not representative of the general population and might therefore limit the generalization of our findings. As citizens with left-wing (vs. right-wing) political views are more likely to indicate that environmental protection is important to them (e.g. Gifford & Nilsson, 2014), they might also be more willing to get nudged to make greener choices and consequently accept both equally well – personally-framed and socially-framed nudges. Hence, compared to other decision-making contexts, the high number of left-wingers in our sample might impact the effect of nudge-framing on its acceptance in the environmental choice context. Besides approaching a representative sample with respect to political orientation, future research on framing and nudging acceptance should further include a condition without any framing in their study design in order to control if the framing manipulation works.

2.6 Implications for environment protection policies: Barriers and opportunities in the use of nudging

The government is increasingly using scientific insights about human behavior in implementing public policies including nudges to address the big societal challenge of protecting our environment. Whether the implementation of green nudges succeeds or not, i.e. whether the nudges indeed promote behavior change towards a more sustainable lifestyle (e.g., cycling to work, using fewer plastic products), also depends on whether citizens approve of these measures. Clarifying when people are more likely to accept a certain green nudge intervention and when they probably reject it is important to detect possible shortcomings (also from the ethical perspective) and to subsequently decide on how to adapt the nudge, or which alternative measures might be more successful facilitating behavior change.

This project adds to the ethical discussion of green nudge interventions and provides insights for their successful implementation in policy making. The general high public support of green nudges, which is in accordance with prior research on nudging acceptance (Reisch & Sunstein, 2016; Sunstein et al., 2018; Sunstein et al., 2019), displays an important prerequisite for the nudges' success in encouraging environmentally friendly behavior. However, our results further indicate that a generally high support of green nudges is not a free pass for each individual nudge, but that their acceptance varies depending on certain nudge characteristics as well as the behavioral domain for which the nudge is introduced. To gain public approval and confidence, policymakers should transparently communicate about the nudge's goal (i.e. reducing gashouse emissions) and in what way the nudge is effective in reaching this goal. Policymakers should further consider that those nudges interfering too much with the individual's autonomous decision-making and demanding high effort to comply with the promoted behavior change, receive significantly less approval. In general, literature indicates that it is essential to

evaluate carefully whether a nudge that is (planned to be) introduced matches the values and norms of the target group (e.g. Reisch & Sunstein, 2016; Sunstein et al., 2019).

Further, this project provides insights on green nudging acceptance for specific choice contexts that are significant for environmental protection. For example, nudges promoting the reduction of meat consumption received on average lower public approval and were also associated with comparatively high effort behavior. To facilitate a certain behavior change requiring a great deal of effort from the target person, behavioral interventions like nudges may not be sufficient. Here, one fruitful approach could be to combine various policies: For example, to reduce meat consumption, in addition to green nudges, educational campaigns could inform people about the negative environmental consequences of intensive animal farming and raise citizens' awareness. Incentives could further be provided to motivate people to take the effort and eat less meat.

To conclude, green nudges were found to be a well-accepted policy tool to promote sustainable behavior, especially when the behavior change is associated with rather low effort for the target person. This project contributes to understanding when people accept green nudges and provides insights on facilitators and barriers for their implementation. Further research should be conducted addressing the limitations discussed to clarify the role of personal versus societal framing of green nudges for their acceptance.

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3 I Like It, I Like It Not: Ambivalence In Plastic Packed Food

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Abstract

Driving cars, eating meat, plastic wraps. We want to avoid them but we use or consume them anyway. They all have a negative impact on the environment but are still popular due to convenience, taste, or the lack of alternatives. This simultaneous existence of positive and negative evaluations leads to the experience of ambivalence. Ambivalence might help to explain why people are still hesitating to get rid of environmentally harmful behaviors, despite their awareness of the negative consequences. Thus, changing ambivalent evaluations into univalent negative evaluations might be a good starting point for interventions. In the current chapter, we review the effect of one-sided (only positive vs. only negative) information interventions on plastic-related ambivalence. Using the MouseTracker paradigm, we found that participants showed greater ambivalence toward plastic packed food than unpacked food. This ambivalence, however, was not affected by a one-sided information intervention. We discuss how these findings can be used to improve interventions to help decrease the use of plastic.

3.1 The Plastic Problem

Driving cars, meat consumption, food waste, and air travel might be the first private household behaviors that people consider to reduce their greenhouse gas (GHG) emissions. However, many people underestimate the GHG emissions of the plastic lifecycle. In 2019, for example, the GHG emissions of all plastics produced and burned (850 million metric tons in 2019; Hamilton et al., 2019) were higher than the total yearly GHG emissions of Germany (808.73 million metric tons in 2016; Ritchie & Roser, 2020). Plastic production increased exponentially over the last half-century (World Economic Forum, 2016). If this trend continues, 15% of the global carbon budget of 2050 could be comprised of plastic (World Economic Forum, 2016), thus, threatening the goal of limiting temperature rise to 1.5°C (Hamilton et al., 2019).

Not only GHG emissions from plastic threaten the environment, but also its long degradation process from macro to micro plastic. Plastic can remain in its recognizable form in the ocean for over 100 years (World Economic Forum, 2016). Even after 100 years, it pollutes the environment as micro or nano plastic (World Economic Forum, 2016). As a result, plastic will continue to accumulate in the environment, even if production and waste are reduced or stopped altogether. Furthermore, plastic already pollutes uninhabited areas like the deep sea or the Antarctic (Cunningham et al., 2020), and it also has been found in rain (Wetherbee et al., 2019). Most alarmingly, plastic has been found in the human body (FAO & WHO, 2010). In the human body, it is associated with type 2 diabetes (Rancière et al., 2019) and heart disease (Cai et al., 2020). Therefore, plastic not only aggravates climate change and environmental degradation but also threatens human and animal health.

3.2 Plastic Attitude

With increasing knowledge and concerns about the detrimental consequences of plastic, research on attitude toward plastic and plastic consumption has also increased (for a review see

Heidbreder et al., 2019). The most exhaustive attempt to study attitude towards plastic was by Zwicker et al. (2020). Conducting a network analysis, they found that plastic is associated with positive and negative aspects as well as positive and negative emotions. We like plastic, because it is convenient, lightweight, and transparent and we don't like it, because it threatens human and animal health. This simultaneous existence of positive and negative evaluations of plastic leads to ambivalence. Even though ambivalence is often overlooked in environmental attitudes (Buttlar & Walther, 2019), research in other behavior domains indicates that ambivalence determines behavior (e.g., Armitage & Conner, 2000). That is, people with low ambivalence act more consistently with their attitude than people with high ambivalence (Cooke & Sheeran, 2004). Therefore, the studies reviewed here investigate ambivalence in plastic perception and try to influence it as a possible lever for interventions.

3.3 Investigating Plastic Related Ambivalence

Ambivalence is defined as simultaneously positive and negative evaluations toward one attitude object (van Harreveld et al., 2015). When people describe ambivalence, they report wavering between the response options or that they feel torn. This conflict also manifests in behavior, for example, as side to side movement (Schneider et al., 2013). Hand movements recorded via a computer mouse are especially handy to validly capture ambivalence. Schneider et al. (2015) validated a task to measure ambivalence using the MouseTracker software (Freeman & Ambady, 2010). In this task, participants initiated a trial by clicking the start button in the bottom middle of the screen. After that, a picture appears in the middle of the screen and participants have to move the mouse to one of the top corners of the screen to categorize the object either as positive or negative. Therefore, not only participants' real-time processing is captured by recording the mouse movement but also the global evaluation (i.e., clicking on the negative or the positive button). If participants have to categorize an ambivalent object, the movement of the mouse to the chosen response has more pull to the non-chosen response. In contrast, if participants have to categorize a univalent object, the movement of the mouse to the chosen response is a relatively straight line.

In both studies, pictures of food (cucumber, white mushrooms, iceberg lettuce, brown mushrooms, tomatoes, broccoli, beetroot, pointed cabbage, Chinese cabbage, corn) either unpacked or packed in transparent plastic were used to reduce variance in the material whilst simultaneously ensuring visibility. The results of Study 1 show that plastic packed food elicited more ambivalence (i.e., pull to the non-chosen response) compared to unpacked food. For example, the mouse movement shows a greater pull to the non-chosen response whilst evaluating plastic packed mushrooms (Figure 1, lower panel) compared to unpacked mushrooms (Figure 1, upper panel). Furthermore, plastic packed foods were evaluated more negatively compared to unpacked foods (i.e., negative as chosen option). This negativity is based on the packaging of the food because the pictures showed the same food packed in transparent plastic and unpacked.

In the second study, we used text interventions to influence plastic-related ambivalence. We hypothesized that information about positive aspects of plastic (inconsistent with the global evaluation of plastic in Study 1) should increase ambivalence whilst information about negative aspects of plastic (consistent with the global evaluation of plastic in Study 1) should decrease ambivalence. To increase the effectiveness of the interventions, we gave information consistent with the context of the pictures. That is, participants read a text either about the positive aspects

of plastic packaging for food (e.g., protection) or the negative aspects of plastic packaging for food (e.g., health issues). The hypothesis, however, was not confirmed. The text interventions did not influence plastic-related ambivalence. Plastic packed food was still evaluated more negatively and elicited more ambivalence compared to unpacked food. For greater details see Hahn et al. (2021).

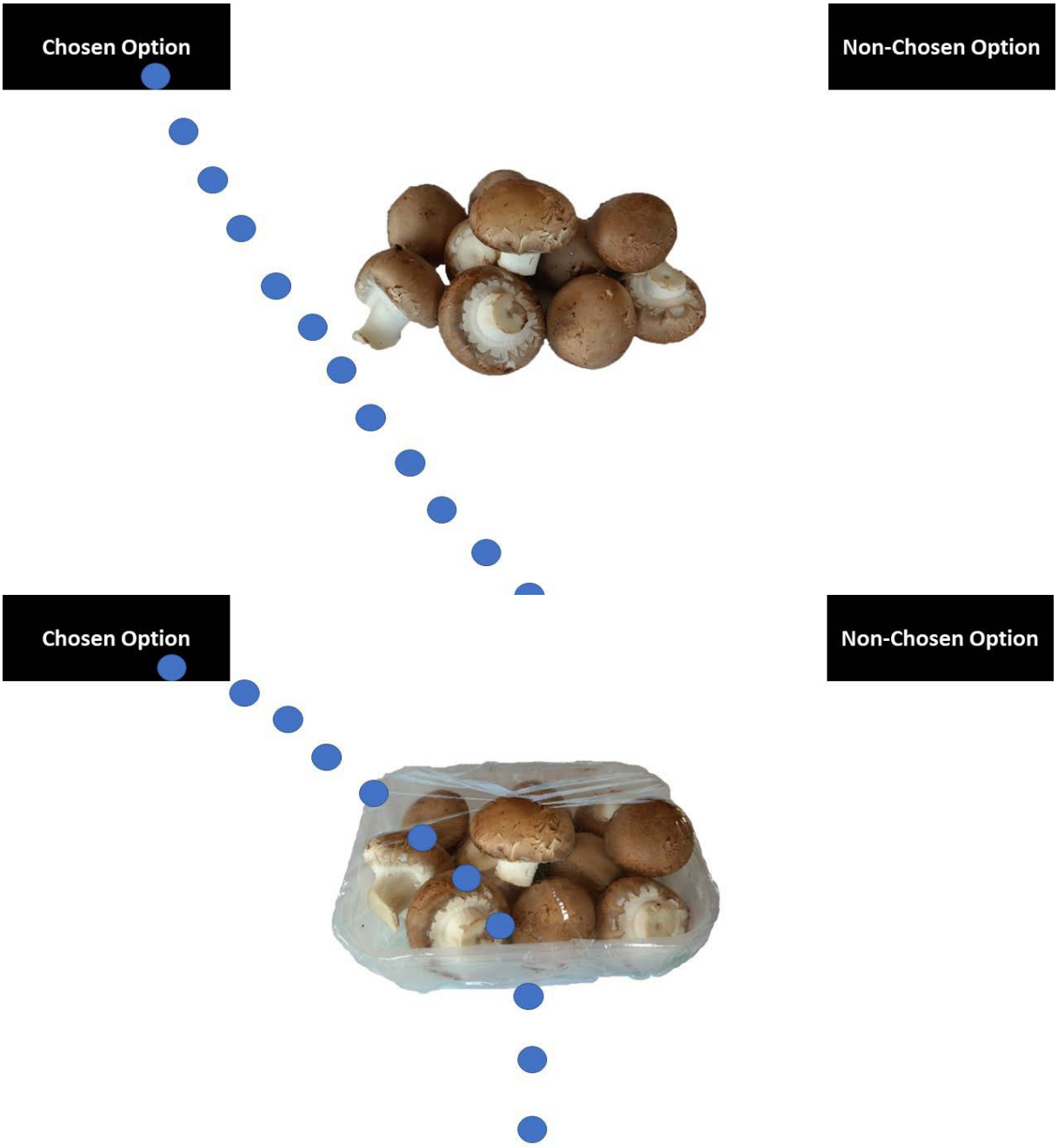

Figure 1: Example stimuli for food packed in plastic and unpacked food. The lower panel depicts a trial with plastic packed food and pull towards the non-chosen response. The upper panel depicts a trial with unpacked food and no pull towards the non-chosen response. The blue dots indicate the mouse movement, however, they were not visible for the participants (Hahn, et al., 2021).

3.4 Implications for environment protection interventions and policies

Generally, people's attitude toward plastic tend to be negative. Additionally, people feel ambivalent towards plastic and this ambivalence seems to be persistent to influence. Giving additional negative information did not influence attitude towards plastic. In line with these results is also that increasing knowledge not always translates into behavior. For example, Dunn et al. (2020) investigated the effect of watching Blue Planet II – a documentary on marine life with a focus on conservation messaging – on plastic consumption. They found that the knowledge about the environmental issue increased after watching the documentary, however, this did not translate into behavior.

On the positive side, research on interventions aiming to reduce plastic use is increasing rapidly. For example, habits or more specifically, breaking habits seems to lead to promising effects (Heidbreder et al., 2020; Heidbreder & Schmitt, 2020) and social as well as environmental incentives have been effective in reducing plastic bag use (Lange et al., 2021). Another finding is that people who experience guilt about their plastic consumption are more willing to donate to a sustainable cause (Zwicker et al., 2020). Interestingly, not everyone experiences guilt about his or her plastic use. This can be explained by people justifying and downplaying the effects of their behavior. People might argue that there is a lack of alternatives to plastic, thus, they have to buy products packed in plastic or that they already buy products packed in as little plastic as possible, thus, they already reduced their plastic consumption (Atkinson & Kim, 2015). These strategies justify people's plastic consumption. Therefore specifically targeting people's justification strategies might be a way to improve the effectiveness of interventions, not only for plastic consumption but also for other ambivalent environmental behavior like eating meat (Buttlar, Rothe, et al., 2021) or wasting food (Buttlar, Löwenstein, et al., 2021). On the negative side, given the stability of the plastic use habit and the omnipresence of plastic, we all have still a long way to go to ban plastic and implement suitable alternatives. That is why political steps like legal regulations and bans should be enforced even more to solve the plastic problem.

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4 (Not) Doing the Right Things for the Wrong Reasons: An Investigation of Consumer Attitudes, Perceptions, and Willingness to Pay for Bio-Based Plastic

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Abstract

Fossil-based plastics are significant contributors to global warming through CO2 emissions. For more sustainable alternatives to be successful, it is important to ensure that consumers become aware of the benefits of innovations such as bio-based plastics, in order to create demand and a willingness to initially pay more. Given that consumer attitudes and (inaccurate) beliefs can influence the uptake of such new technologies, we investigated participants' attitudes towards fossil-based and bio-based plastic, their perceived importance of recycling both types of plastic, their willingness to pay, and their perceptions of bio-based plastic in four studies (total N = 961). The pre-registered fourth study experimentally manipulated information about bio-based plastic and measured willingness to pay for different types of plastic. The results suggest participants hold very favourable attitudes and are willing to pay more for bio-based products. However, they also harbour misconceptions, especially overestimating bio-based plastic's biodegradability, and they find it less important to recycle bio-based than fossil-based plastic. Study 4 provided evidence that educating consumers about the properties of bio-based plastic can dispel misconceptions and retain a favourable attitude and a high willingness to pay. We found mixed evidence for the effect of attitudes on willingness to pay, suggesting other psychological factors may also play a role. We discuss how attitudes and misconceptions affect the uptake of new sustainable technologies such as bio-based plastic and consumers' willingness to purchase them.

4.1 Introduction

Plastics are an extensive family of different materials designed for specific applications. In our daily lives, we are continuously surrounded by plastic in grocery packaging, clothes, other fabrics, transportation, medical devices, household objects, and tools, including electronics. In 2019, global plastic production reached 370 million tonnes, with 39.6% for packaging (PlasticsEurope, 2019). While plastics are a valuable resource that benefit society in numerous ways, they also contribute to marine litter and climate change, emitting almost 1 billion metric tons of CO2 emissions in 2019 (Hamilton et al., 2019).

Consumers are becoming increasingly aware that plastic can have harmful effects on the environment, which is at least partially due to the increased media coverage on the topic over the past few years (RESTCo, 2020). However, much of consumers' concern focuses on the post-consumption or end-of-life effects of plastic on the environment, such as recyclability, biodegradability, and reusability (Heidbreder, Bablok, Drews, & Menzel, 2019; Herbes, Beuthner, & Ramme, 2018). The effect of plastic on the environment, however, starts well before it hits store shelves – it starts with the extraction of fossil fuels. Around 99% of virgin plastics are derived from fossil

fuels (i.e., oil, coal, or natural gas) (European Bioplastics, 2019). Plastic volumes are expected to triple to more than a billion tons by 2050, so for plastic to not overwhelm the total 2050 CO2 emissions budget (4–8 billion tons), there are 30 years to reduce the carbon footprint of plastic. The only alternative carbon feedstock for making virgin (non-recycled) plastics is biomass (Murcia Valderrama, van Putten, & Gruter, 2019).

Transitioning away from fossil-based plastic is difficult, especially because the continued increase in plastic production and use (PlasticsEurope, 2019; Ritchie, 2018) suggests that being aware of plastic waste in itself is not enough to persuade consumers to change their behaviour. Technological developments alone are also not sufficient to successfully make the transition; the adoption of new technologies by consumers, as well as a change in attitude and behaviour, is key. In order for new, more sustainable plastic alternatives to be adopted, a different type of awareness is needed – not just of the pollution of natural environments, but also of the production process, carbon footprint, and specific characteristics of plastic products.

The overall aim of the current research is to investigate consumers' willingness to adopt and pay for alternatives to fossil-based plastic. We focus on bio-based plastics, which are plastics derived from renewable materials, or 'biomass' (Lynch, Klaassen, Broerse, 2017; PlasticsEurope, 2019; van den Oever, Molenveld, van der Zee, Bos, 2017), because biomass is the only alternative material for making virgin (non-recycled) plastics (Murcia Valderrama et al., 2019). While product adoption and willingness to pay are important from an economic perspective, we also investigate the underlying psychological processes that make consumers more willing to pay. We therefore investigated several psychological fac-tors that might influence consumers' willingness to pay, such as attitudes and bio-based plastic perceptions (e.g., its recyclability and biodegradability). We also experimentally manipulated the knowledge participants receive about bio-based plastic to determine how that affects their attitudes, willingness to pay, and perceived importance to recycle.

4.1.1 Bio-Based Plastic

With new technological advances such as bio-based plastic, it is possible to retain the advantages and characteristics of conventional fossil-based plastics while reducing the impact plastic has on global warming. Bio-based plastics are derived from biomass, such as sugar cane, starch, vegetable oils, etc. (Lynch et al., 2017; PlasticsEurope, 2019; van den Oever et al., 2017). Regardless of being fossil- or bio-based, certain plastics are biodegradable (i.e., under very specific conditions, they can biodegrade into mainly CO2 and water, and compost), while others are not, depending on the application they were designed for (PlasticsEurope, 2019; van den Oever et al., 2017). Thus, many plastics made from biomass are not (readily) biodegradable (the bio-based plastics studied in this research are not) and therefore do not alleviate the pollution of natural environments. What makes bio-based plastics more sustainable than conventional fossil-based plastics is that they are produced from carbon that is already in the atmosphere: plants capture atmospheric CO2 during photosynthesis to produce biomass. Thus, even if bio-based plastics release the same amount of CO2 upon incineration as waste at the end of life as fossil-based plastics, the CO2 released was already above the ground. Therefore, no extra CO2 is added when using this CO2 → biomass → bio-based plastic → CO2 cycle, apart from emissions from agricultural machines and fertilisers, leading to a much smaller overall CO2 footprint (Gruter, 2019; Zwicker, Nohlen, Dalege, Gruter, van Harreveld, 2020). The largest benefit of bio-based plastic

therefore lies in the material that it is made of (i.e., above the ground renewable material of biological origin).

4.1.2 Lack of Knowledge

For alternatives to conventional plastics to be successful, adoption by consumers is key to generate a market pull. Products made from bio-based plastic are initially more expensive, while production is small and the processes are not optimised. It is therefore essential for companies and governments to stimulate consumer demand, for example through marketing. Without consumer demand, there is no incentive for companies to adopt bio-based plastics, as this can be financially costly. It is therefore important to ensure that consumers become aware of the benefits of innovations such as bio-based plastics in order to create a demand for them. This research, therefore, aims to investigate consumers' attitudes and perceptions towards bio-based plastics, as well as their willingness to pay a price premium. We also aimed to determine the effects that different levels of information about bio-based plastic can have on the above-mentioned variables.

While more and more plastic alternatives such as bio-based plastics are entering the market, consumers lack the knowledge of what it means if a product is 'bio-based' or 'biodegradable'(Kainz, Zapilko, Decker, Menrad, 2013). Many consumers appear to think that bio-based products are automatically biodegradable, which is not necessarily the case. The lack of knowledge can lead consumers to form their attitudes based on incorrect associations and expectations about bio-based plastics (Blesin, Jaspersen, & Möhring, 2017). In turn, the expectations and attitudes consumers have towards bio-based plastic can influence their behaviour.

4.1.3 Attitudes

Attitudes are a key predictor of behaviour see (for an extensive overview, see Ajzen & Fishbein, 2005). In the present research, we therefore investigate people's attitudes towards plastic (both bio-based and conventional) as a first step in understanding how to best persuade people to adopt a more sustainable plastic-behaviour. We argue that consumers' positive and negative evaluations regarding plastic are likely to vary independently. The extent to which one thinks plastic is useful might very well be unrelated to how much one thinks plastic contributes to climate change (Sijtsema et al., 2016). In the present research, we therefore separately assess both the positive and negative evaluations people hold towards fossil-based and bio-based plastic, rather than in a single bipolar scale (for a similar approach, see Zwicker et al., 2020).

In some cases, consumers might have positive associations with bio-based plastics for the wrong reasons, i.e., most consumers think that all bio-based plastics are biodegradable. People's perceptions of bio-based plastics may become less positive when they realise that being bio-based and being biodegradable are completely disconnected features. Conversely, few consumers realise that plastics and climate change are connected, as discussed above, and that bio-based alternatives can be a solution to this problem. In this work, we continue the investigation into attitudes towards bio-based plastics by Zwicker et al. (2020) we assess people's attitudes towards both conventional and bio-based plastic in a series of four studies, to obtain a better understanding of people's general evaluation of these different types of plastics. We also report on how consumers' attitudes change (in a negative or in a positive way) after communicating factual information about the biodegradability and the carbon footprint of bio-based plastics

(Study 4). Having a favourable attitude and accurate knowledge of bio-based plastics is the foundation of consumer acceptance and willingness to pay (more) for bio-based plastic. This shift will support a durable transition towards a more sustainable plastic economy.

4.2 Overview of Studies

In four online studies, we examined consumers' attitudes and perceptions about conventional and bio-based plastics. In our first study (N = 97), we aimed to investigate whether participants' attitudes differed with regards to conventional and bio-based plastics. Study 2 (N = 52) replicated these results and examined behavioural factors such as willingness to pay and perceived importance to recycle, in order to test the attitude-behaviour relationship. The third study (N = 508) aimed to replicate the results of the previous studies with a larger sample. It also assessed participants' most common misconceptions towards bio-based plastic, as they might influence both plastic-related attitudes and behaviour. To extend the correlational previous studies, Study 4 (N = 304) was a pre-registered experimental study that manipulated knowledge about bio-based plastic and measured the effect of this manipulation on attitudes, importance to recycle, willingness to pay, and objective pro-environmental behaviour. For an overview of the studies and measures, see Table 1. More detailed information about the measures and results can be found in the full article (https://www.mdpi.com/2071-1050/13/12/6819). Additional analyses and even more details can be found in the Supplementary materials (https://osf.io/p3ftu).

Table 1: Overview of Studies 1 to 4 and the concepts they assessed.

Assessed	**Study 1** (N = 97)	**Study 2** (N = 52)	**Study 3** (N = 508)	**Study 4** (N = 304)
Attitudes	✓	✓	✓	✓
Perceived importance to recycle		✓	✓	✓
Willingness to pay		✓	✓	✓
Perceptions of bio-based plastic			✓	
Manipulation of level of knowledge				✓
Prior knowledge				✓

4.3 Study 1

This exploratory study aimed to establish whether participants had differing attitudes towards fossil-based and bio-based plastic, and if this was the case, how they differed.

4.3.1 Participants and Procedure

See Table 2 for sample details of the 97 participants. After consenting to take part, participants reported their demographic information and responded to a series of qualitative questions concerning conventional and bio-based plastic that are documented in the full manuscript and its supplementary material. They then reported their attitudes towards both types of plastic before being debriefed and paid.

Table 2: Sample details for Studies 1 to 4.

	Study 1	**Study 2**	**Study 3**	**Study 4**
Number of participants	97	52	508	304
Gender				
Female (%)	61 (62.9%)	29 (55.8%)	268 (52.7%)	164 (53.9%)
Male (%)	36 (37.1%)	23 (44.2%)	232 (45.7%)	137 (45.1%)
Preferred not to say/other (%)	0 (0%)	0 (0%)	8 (1.6%)	3 (1.0%)
Mean age (SD)	33.9 (12.1)	28.5 (9.7)	32.4 (10.8)	34.7 (12.1)
Age range	18–64 years	18–68 years	18–72 years	18–74 years
Education completed (%)				
secondary education	30.9%	26.9%	24.2%	26.9%
undergraduate degree	50.5%	42.3%	47.4%	42.3%
postgraduate education	8.4%	21.2%	17.9%	21.2%
trade/technical/or vocational training	9.3%	9.6%	8.7%	9.6%
primary school	1.0%	0.0%	1.8%	0.0%
Country of residence				
United Kingdom	58%	46%	33.1%	61.5%
Europe	28%	44%	46.1%	29.6%

North America	14%	8%	17.1%	4.3%
Other	0%	2%	3.7%	4.6%

4.3.2 Results and Discussion

Study 1 provided a first indication that participants' attitudes differ from one type of plastic to another. The results show that bio-based plastic was evaluated more positively (and less negatively) than conventional plastic (Figure 2). We next aimed to replicate this finding and assess behavioural factors related to bio-based plastic, namely the perceived importance to recycle the different types of plastic and people's willingness to pay.

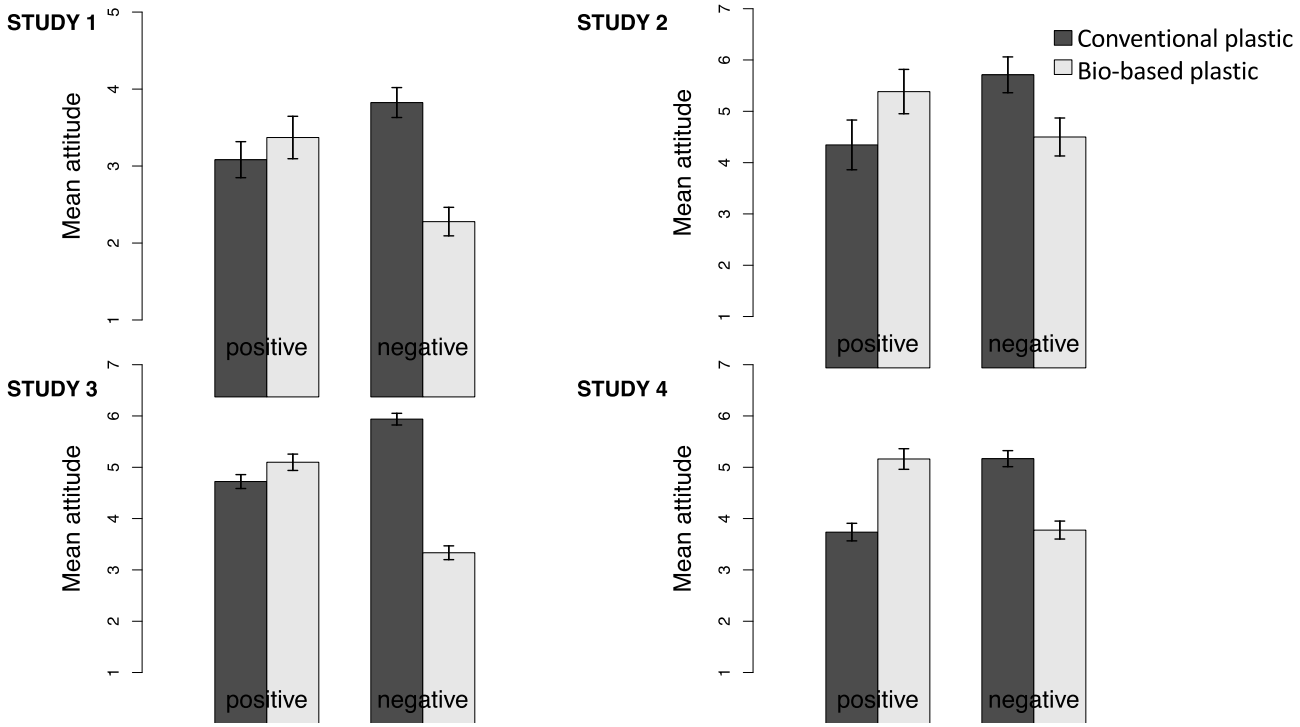

Figure 2: Mean attitudes towards regular and bio-based plastic for Studies 1 to 4. Error bars represent the standard error.

4.4 Study 2

The first study indicated positive attitudes towards bio-based products. As attitudes are presumed to influence behaviour, we wanted to investigate whether attitudes would relate to participants' willingness to pay more for bio-based products. Due to small production scales and an early stage of technology development, these new materials are likely to be initially more expensive. For new and more sustainable technologies to be made widely available, companies need to know that consumers are willing to pay more to make the financial investment worth it. There are studies that suggest consumers would indeed be willing to pay 'a little' more for bio-based products (Lynch et al., 2017), but the literature is sparse on the willingness to pay for bio-based products. We hypothesised that consumers would have a more positive (and less

negative) attitude towards bio-based plastic than towards fossil-based plastic. Whether participants would be willing to pay more for a bio-based product than for an item made from conventional plastic was purely exploratory. We expected that attitudes would influence participants' willingness to pay, although we had no clear predictions about whether it would be positive attitudes towards bio-based or negative ones about fossil-based plastic (or both) that would drive that willingness.

Furthermore, despite the generally positive attitudes towards bio-based plastic, uncertainty remains about how to correctly dispose of bio-based products (Lynch et al., 2017; Taufik, Reinders, Molenveld, Onwezen, 2020). People may know how to correctly dispose of non-biodegradable recyclable plastic but not how to deal with (biodegradable) bio-based plastic (Taufik et al., 2020). This is problematic because the common misconception that all bio-based plastics are biodegradable could lead to a continuation (or even increase) of littering, with consumers assuming that this type of plastic waste will degrade in nature. Additionally, bio-based plastic might be perceived as a technical solution to the plastic problem that does not require specific actions or a change in behaviour from the individual, effectively removing any responsibility from the consumer to dispose of plastic products properly (Haider, Volker, Kramm, Landfester, Wurm, 2019). We therefore also assessed how important participants considered recycling of both conventional and bio-based plastics.

4.4.1 Participants and Procedure

See Table 2 for sample details of the 52 participants. After consenting to take part, participants received information about conventional and bio-based plastics. They then reported their willingness to pay, their perceived importance to recycle, and their attitudes about both types of plastic. Before being debriefed and paid, they also filled in their demographic information.

4.4.2 Results and Discussion

Study 2 replicated that participants have more positive attitudes toward bio-based than conventional plastic and that this was driven by being more positive and less negative about the more sustainable plastic (Figure 2). Study 2 also demonstrated that people report being willing to pay on average EUR0.30 more for a bio-based plastic water bottle than for a bottle made from conventional plastic. The results suggest that participants' attitudes towards conventional but not bio-based plastic might have influenced their willingness to pay more for a bio-based product. Participants also reported finding it less important to recycle bio-based plastic. This indicates that, while participants have positive attitudes towards bio-based plastic, they may also have misconceptions which may drive their apparent willingness to pay, as well as their perception that it is less important to recycle bio-based plastic. In practice, it is just as important to recycle bio-based plastic as regular plastic, as both are harmful to the environment as they degrade slowly.

4.5 Study 3

Previous research suggests that consumers lack knowledge about bio-based plastics and thus fill this knowledge gap with assumptions. That all bio-based plastics are biodegradable seems to be the most common misconception (Herbes et al., 2018; Kainz et al., 2013; Koutsimanis, Getter, Behe, Harte, Almenar, 2012; Lynch et al., 2017); however, there is also uncertainty about the

disposal (Lynch et al., 2017; Taufik et al., 2020) and recyclability (Study 2) of bio-based products. Other perceptions pertaining to bio-based plastic are concerns about the production of biomass (required to make bio-based plastic) leading to deforestation and competition with land for food production (Blesin et al., 2017; Lynch et al., 2017; Zwicker et al., 2020) Supplementary Materials, Study 1). However, research so far shows these concerns to be unfounded. Bio-based plastics are mostly made from carbohydrate-rich food crops, such as corn, sugar cane, and plant oil (i.e., first generation feedstock). It is on no way competing with the land use for food or animal feed, as the land use for the production of bio-based plastic only accounts for 0.01% of agricultural land use, and is predicted to stay this low (European Bioplastics, 2016; Lovett & de Bie, 2016). Research is also being carried out on large-scale use of second-generation feedstock (crops and plants not suitable for human or animal consumption, such as straw, forestry residues, corn stover, or bagasse, which are usually left on the field) and third generation feedstock (i.e., biomass derived from algae) (Barrett, 2018; European Bioplastics, 2016), which would further reduce possible competition.

As these kinds of perceptions might influence consumers' (bio-based) plastic-related attitudes, behaviour, and willingness to pay, we investigated next whether participants shared these perceptions. As in the previous study, we also assessed participants' general attitudes about both conventional and bio-based plastic, their perceived importance to recycle, and willingness to pay.

While we expected that our participants would share (at least some of) the perceptions of bio-based plastic found in previous research, we did not have any specific hypotheses as to the frequency of these perceptions. As in Study 2, we hypothesised that consumers would have a more positive (and less negative) attitude towards bio-based plastic than towards fossil-based plastic, and that attitudes would be related to willingness to pay. Again, we did not make any predictions about whether it would be attitudes towards bio-based or fossil-based plastic or both that would relate most strongly to willingness to pay (we found the sample size in Study 2 too small to add a specific direction towards our expectation based on its findings). We also hypothesised that participants would be willing to pay more for a bio-based than for a fossil-based plastic bottle and that they would find it more important to recycle products made from conventional plastic than those made from bio-based plastic (i.e., direct replication of the results of Study 2).

4.5.1 Participants and Procedure

See Table 2 for sample details. A sensitivity power analysis (paired samples t-test) revealed that with a sample of 508 participants we had 80% to detect a small effect ($d = 0.18$) at $\alpha = 0.05$. After reading the information letter and consenting to take part, participants read infor-mation about the difference between conventional and bio-based plastics. First, participants reported their perceived importance to recycle and their attitudes about conventional, then about bio-based plastic. Next, they responded to the perception/misconception items. Finally, their demographic information was noted, and the participants were debriefed and paid.

4.5.2 Results and Discussion

In Study 3 we directly replicated that participants were both more positive and less negative towards bio-based compared to conventional plastic (Figure 2). We also found that the assumptions or misconceptions about bio-based plastic found in previous literature (i.e., concerning

recyclability, biodegradability, deforestation, and competition with food production) were also present in the current sample, with the incorrect assumption that bio-based products are biodegradable being most prevalent. We also found a strong belief in the recyclability of bio-based plastic, but also replicated that participants found it less important to recycle bio-based compared to conventional plastic products. We again found that participants were willing to pay more for bio-based than fossil-based plastic products (on average EUR 0.21 more). While in Study 2 we only found attitudes towards conventional plastic to be predictive of willingness to pay, in Study 3 we found that attitudes towards both plastic types influenced willingness to pay for a bio-based bottle.

4.6 Study 4

Above, participants evaluated bio-based plastic more favourably and reported being willing to pay more for it than for conventional plastic, with some indication of attitudes being related to willingness to pay. Having only assessed self-reported willingness to pay in our previous studies, we also assessed objective behaviour in the form of a donation. We added a measure of objective behaviour because of the well-known inconsistency or 'gap' between what consumers say they are going or willing to do and what they actually do.

Study 3 suggested that many participants have misconceptions, especially about the biodegradability of bio-based plastic. It is therefore unclear whether the positive attitudes and willingness to pay are (at least partially) due to their misconception of biodegradability and its consequences (e.g., less marine pollution). Such attitudes that are positive for the wrong reasons may lead to disillusionment among consumers who learn more about the nature of bio-based plastics. Indeed, some research suggests that when confronted with information that bio-based plastic either is not biodegradable, or only under very specific composting conditions (as is the case for biodegradable plastic), consumers can react 'shocked and disappointed' (Blesin et al., 2017).

In the present study, we investigated ways through which such disillusionment may be avoided. We manipulated the amount of information about bio-based participants received in order to vary misconceptions. The main question was whether people still feel positive towards and are willing to pay more for bio-based plastic after learning that not all bio-based plastic is biodegradable and that its true advantage is lowering CO2 emissions. We again focus on bio-based plastic that is not biodegradable. This allows us to distinguish between participants' attitudes towards bio-based plastic from their attitudes towards biodegradability (Herbes et al., 2018).

4.6.1 Conditions and Hypotheses

We used three conditions (control, negative, balanced) in which we varied the amount of information about bio-based plastic participants received, with the aim to reduce misconceptions about biodegradability (Table 3). In particular, we wanted to be able to distinguish between a partial (negative condition) and complete resolution (balanced condition) of misconceptions. While positive attitudes are better than negative ones for the adaptation of more sustainable plastics, positive attitudes based on misconceptions can prove fragile when people learn more about the actual properties of bio-based plastic. In addition, there are good reasons for consumers to be positive about bio-based plastics that are based on renewable resources and reduce CO2 emissions. While reducing the misconceptions might not lead to as positive of an attitude

than the one many people hold before learning more about bio-based plastic, it may lead to more stable attitudes.

Table 3: Hypotheses on product knowledge (i.e., biodegradability and CO_2 footprint) and attitudes about bio-based plastic per condition (Study 4, *N* = 304).

		Message Condition		
		Control	Negative	Balanced
Knowledge	Biodegradability	low	correct	correct
	CO_2 footprint	none	none	correct
Attitude		+	–	+/– (stable)

We expected that the manipulation of knowledge would also have an effect on people's willingness to pay (both self-reported and objective behaviour). In particular, we expected that compared to the control condition, participants would be willing to pay the lowest amount in the negative condition, in which participants are told that not all bio-based plastics are biode-gradable. We hypothesised that adding a description of the benefits of bio-based plastic in the balanced condition would lead people to be willing to pay more in this condition than in the negative condition, but less than in the control condition.

4.6.2 Participants and Procedure

See Table 2 for sample details. The participants received GBP 0.85 as compensation for this approximately ten-minute study. We also asked participants about their prior knowledge of bio-based plastic, to test whether the general lack of knowledge about bio-based plastics reported in previous research (Dilkes-Hoffman, Ashworth, Laycock, Pratt, Lant, 2019; Herbes et al., 2018; Kainz et al., 2013; Koutsimanis et al., 2012; Lynch et al., 2017), is reflected in participants' self-reported knowledge level. The majority of participants reported having little prior knowledge of bio-based plastic.

After consenting to take part, participants were randomly assigned to one of three conditions: control, negative, and balanced. They were then asked how much knowledge they had about bio-based plastic and read an informational text about bio-based plastic (the content depended on the condition). This was followed by the manipulation check and the same questions about their attitude as in the previous studies. Participants were also asked how important they thought it was to recycle regular and bio-based plastic, before they indicated their willingness to pay (bottle and donation). Participants then filled out demographic information and were debriefed and paid.

4.6.3 Results and Discussion

In this pre-registered experimental study, we replicated the findings from the previous three studies concerning participants' attitudes towards both conventional and bio-based plastic (Figure 2). We also successfully manipulated participants' level of knowledge about bio-based plastic and found that this influenced the attitudes they had towards bio-based plastic. In particular,

participants' evaluations of bio-based plastics were most positive in the control condition (with misconceptions), least positive in the negative condition in which they were informed that not all bio-based plastics are biodegradable, and somewhere in between in the balanced condition in which participants received additional information about the small CO2 footprint of bio-based plastics.

As in Studies 2 and 3, participants reported being willing to pay more for a bio-based product, compared to one made from conventional plastic. However, the willingness to pay was lower than in the previous study, with participants indicating that they would be willing to pay on average GBP 0.05 more for a bio-based bottle. GBP 0.05 might not seem like much, but the production cost for a fossil-based plastic water bottle is between USD 0.02 (GBP 0.015) and USD 0.04 (GBP 0.03)(IEA, 2014). Willingness to pay (only the bottle measure) was affected by condition, with participants in the negative condition being willing to pay less than in the other two conditions. Contrary to hypotheses, there was no effect of attitude on willingness to pay, nor did attitude influence the relationship between condition and willingness to pay. However, misconceptions about bio-based plastic's biodegradability led participants to think it less important to recycle products made from bio-based compared to those made from conventional plastic.

4.7 General Discussion

In combatting climate change, the development of more sustainable technologies has to go hand in hand with enhancing consumers' willingness to adopt these technologies. For example, consumer attitudes and perceptions are important when introducing a new technology such as bio-based plastic to the market, because cognitions can influence how much people are willing to pay for sustainable alternatives. There are many cases where more sustainable products or new technologies were not readily accepted by consumers, e.g., Nike's line of environmental 'Considered' shoes, car manufacturers switching their wiring from conventional to soy-based plastic, or certain genetic modifications (Confente, Scarpi, Russo, 2020; Sijtsema et al., 2016). With the present research, we tested how this might be avoided for bio-based plastics.

The current results provide insight into consumers' attitudes towards conventional and bio-based plastics. Throughout all four studies, we found that participants had more positive and less negative evaluations of bio-based compared to conventional plastic products. Even when participants gained more knowledge about bio-based plastic and its characteristics, their attitudes remained positive (Study 4). However, attitudes alone do not paint the whole picture. We found some indication that attitudes about the different types of plastic directly affect people's willingness to pay (Studies 2 and 3). However, those results did not replicate in Study 4.

4.7.1 Misconceptions

That people have positive attitudes towards bio-based plastics is encouraging. However, throughout our studies, we also found that participants had very little prior knowledge about bio-based plastic and harboured several misconceptions, including that bio-based plastic is by default biodegradable. This potentially makes these positive attitudes unstable, as they are likely based on these misconceptions. Positive attitudes that are based on misconceptions pose a risk for two reasons. Firstly, learning that they have been positive for the wrong reasons may lead people to become more negative or even feel cheated because they had the wrong assumptions. Previous literature shows that consumers can react "shocked and disappointed" when told that

bio-based plastic does not have all the properties they believed it to possess (Blesin et al., 2017). This was also demonstrated in in the negative condition of Study 4 – when participants were told that bio-based plastics are not by default biodegradable and thus do not alleviate problems such as marine pollution, their attitudes became more negative. Secondly, people might attribute positive characteristics to bio-based plastic that are in fact untrue (that bio-based plastic is always biodegradable) and that can have unwanted behavioural consequences, such as littering. Throughout our research, we consistently found that participants perceived it less important to recycle products made from bio-based plastic, compared to those made from conventional plastic. The results of our final study suggest that this is driven by those participants who believe that bio-based plastic is biodegradable.

As a result, we argue that it is important to educate people about the properties of different types of plastic and their uses, and render them as positive about bio-based plastics as they were before, but now in a more stable fashion, i.e., for the right reasons. Bio-based plastic can have many advantages such as being made from renewable biomass and having a smaller CO2 footprint. In our final study we also demonstrated that the information about bio-based plastic does not need to be extensive to successfully dispel misconceptions. In short, we believe that educating consumers about the properties of different types of plastic can lead to a more durable transition to sustainability than ignoring misconceptions about bio-based plastics. Our research indicates that consumers remain willing to pay a price premium and favourably evaluate this new, more sustainable technology.

From a psychological perceptive, it is valuable to investigate attitudes and perceptions of novel products, as they can determine whether or not the product will be adopted by consumers. Beliefs, both accurate and inaccurate, can drive consumers' willingness to pay and aid in predicting consumer behaviour. The present research thereby contributes to the existing literature by investigating both the applied and economic perspective of the novel bio-based plastics, while also studying the psychological factors (e.g., attitudes and perceptions) that influence consumers' willingness to pay. These results could therefore be useful for not only for companies and their marketing campaigns, but also for policymakers trying to create a demand for more sustainable products. These insights also make it easier to study consumer perception and gauge willingness to pay for novel products.

4.7.2 Willingness to Pay

Previous research suggests that many consumers are willing to pay a premium for environmentally friendly products (see Orset, Barret, Lemaire, 2017). We found the same results with regards to bio-based products. Participants consistently reported being willing to pay 8–30% more for a bio-based compared to a conventional water bottle. Whether this willingness translates into objective behaviour is unknown; we only found a small correlation between participants' self-reported willingness to pay and their objective donation behaviour in Study 4. This might be due to the differing nature of those two pro-environmental tasks (one assessing willingness to pay for a more sustainable plastic bottle and the other asking to donate actual money to help plant real-world trees), or due to a social desirability bias. However, it might also be due to the well-known intention-behaviour gap (Sheeran, 2002), which describes the failure to translate intentions into action.

4.8 General Conclusion

Plastic production and disposal are an often-overlooked contributor to climate change. While consumers are increasingly becoming aware of plastic's negative effects on, among others, marine life, many remain unaware of the large amounts of CO2 that are released during the production and life cycle of plastic products. One possible solution to this plastic problem is the market introduction of more sustainable products (e.g., bio-based plastics). This transition requires that (1) companies provide these environmentally friendly products and that (2) consumers accept and are willing to purchase them. Across four studies, we showed that consumers are very positive towards bio-based plastics and are willing to pay a price premium for them. However, we also demonstrated that many consumers lack knowledge about the properties of these new plastics and harbour misconceptions, particularly by overestimating biodegradability. We also showed that these misconceptions can be resolved through brief written messages. After being informed about bio-based plastics' properties and benefits, consumers attitudes towards products made of bio-based plastic remain positive and they are still willing to pay a price premium. These are encouraging results with regards to a transition towards sustainability, and the results contribute to the broader literature identifying psychological predictors of pro-environmental behaviour, including emotions, values, norms, and beliefs (Bissing-Olson, Fielding, Iyer, 2016; Jaeger & Schultz, 2017; Poškus, 2016; Zwicker et al., 2020).

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5 The importance of well-being for environmental behavior change

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Abstract

A substantial change towards more pro-environmental behavior (PEB) is crucial in order to reach the required reduction in greenhouse gas emissions and mitigate climate change. In this paper, I emphasize the importance of considering the consequences for individual well-being when aiming to change private household behavior to be more environmentally friendly. PEB is often framed as a sacrifice and costly in the public debate. At the same time, studies in environmental psychology regularly find positive correlations between PEB and well-being. I argue that exploring the role of environmental impact could help to explain this apparent paradox and conclude with introducing the rationale of my current research.

5.1 The need for environmental behavior change

The mitigation of climate change is the dominating global challenge of the next decades. It is essential to reduce the amount of greenhouse gases emitted into the atmosphere to minimize severe consequences – e.g., an increase in extreme weather events, melting of glaciers and rising of sea levels (IPCC, 2021). With two thirds of global greenhouse gas emissions linked to private household consumption (Ivanova et al., 2020), mitigating climate change will be difficult to achieve without a substantial change towards more pro-environmental consumer behaviors and lifestyles (Dubois et al., 2019).

PEBs are acts with the aim to help the natural environment (Steg & Vlek, 2009), or more specifically in the context of climate change, to reduce greenhouse gas emissions. PEB covers a large range of behaviors in different domains, from sorting trash and recycling plastic, reducing the amount of pieces of clothing purchased, to eating a vegetarian diet or taking the bike to commute to work. To reach the required reduction of greenhouse gas emissions, large parts of the population of developed countries need to reduce their environmental impact significantly and engage more in PEB.

With climate change awareness on the rise (European Comission, 2019; Gellrich, 2021), more people are taking action to reduce their environmental impact (European Comission, 2019). However, voluntary behavior changes will likely not suffice to achieve the ambitious climate goals. Instead, effective public policy interventions and frameworks are needed to reduce the environmental impact of household consumption (Dubois et al., 2019). While a large percentage of greenhouse gas emissions can be attributed to private household consumption, this does not mean that the responsibility for behavior change should be on the shoulders of consumers alone (Jackson, 2005b) – a view shared by the majority of European citizens (European Comission, 2019).

5.2 Why is well-being important?

A change towards more environmentally friendly consumption will not only have an effect on individual greenhouse gas emissions, but will likely also affect individual well-being. Today's policy-makers face the challenging task of balancing the well-being of their present-day citizens with the well-being of future generations threatened by the impacts of climate change (see also the

article by van Treek et al. in this volume). In this context, the well-being of a person is understood as "the state of being healthy, happy, or prosperous" as defined by the Oxford English Dictionary (2021) including one's feelings, one's ability to function both personally and socially, and one's life evaluation (New Economics Foundation, 2012).

From a policy perspective, individual well-being is inherently valuable. In the Treaty of Lisbon, the promotion of well-being is established as one of the main aims of the European Union (European Union, 2007) and in recent years, well-being measures have increasingly been involved in policy decisions of all domains (European Union: Council of the European Union, 2019). Consequently, the aim of environmental policies should be to reduce greenhouse gas emissions as much as possible – thus protecting the well-being of future generations – while minimizing well-being losses in the present.

For policy-makers (and other decision-makers) it is thus important to keep in mind the consequences of environmental behavior change and policy on well-being. However, these consequences are not only important because of their inherent fundamental value. Instead, they could also have a direct effect on the likelihood and extent of environmental behavior change itself.

Individual well-being is not only important to policy-makers and political institutions – but also to people themselves. In a study by Suh et al. (Diener, 2000; Suh et al., 1998), 69% of university students from different countries value happiness, and 62% value life satisfaction, as extraordinarily important. If people expect that changing their behavior towards being more environmentally friendly enhances their well-being, they will likely be motivated to do so. If they instead expect negative consequences, their motivation may be weaker – slowing down or preventing progress in reducing greenhouse gas emissions. Next to actual well-being consequences, it is thus also important to understand the role of well-being expectations.

This could not only be relevant for individually motivated behavior change – i.e., a person engaging in PEB voluntarily without any policy intervention – but also for political changes. Most countries with large per capita carbon footprints are democracies, meaning that citizens affect policy decisions with their voting behavior and policy acceptance. A negative well-being expectation associated with environmental behavior change could therefore not only slow down or prevent individual engagement in PEB, but also the election of parties with environmental ambitions. Since the speed in which actions are taken to fight climate change is important, consumers' well-being expectations are critical in mitigating climate change.

5.3 What do we know about the relationship between well-being and PEB

One reason, why environmental behavior change can impact individual well-being is that the engagement in environmentally friendly behaviors is often associated with behavioral cost (Kaiser et al., 2021; Kollmuss & Agyeman, 2002). Behavioral cost can be understood financially, as in paying more for environmentally friendly products compared to conventional ones, but also figuratively. For example, some behaviors are associated with an increase in effort (e.g., sorting and recycling trash), a loss in comfort (e.g., cycling to work instead of taking the car), or a loss in pleasure (e.g., going somewhere local instead of a tropical long-distance vacation).

In fact, in public debate or climate change communication, environmental behavior change is often framed as a sacrifice that needs to be made for the greater good, emphasizing the cost of

the behavior (Kaplan, 2000; Prinzing, 2020). Contrary to this public perception however, research in environmental psychology finds evidence for the opposite: Many studies find positive correlations between engagement in PEB and well-being (see Zawadzki et al., 2020 for a meta-analysis). This apparent paradox is the starting point of my PhD project. If engaging in PEB is associated with higher well-being levels, why do people avoid increasing their engagement in PEB? It could be merely an issue of communication – people do not know that PEB is associated with well-being – but it is likely that the subject is more complex.

To understand this paradox, it is essential to comprehend how environmental psychological theories explain the positive correlation between PEB and well-being. One theory implies that the things that make people happy – such as strong relationships or a sense of purpose – do not require environmentally harmful behaviors. If people focus on these things, instead of on materialism or consumerism, feeling happier and being more sustainable are compatible (Csikszentmihalyi, 2000; Jackson, 2005a). Closely related to this argumentation is the theory of psychological needs (Ryan & Deci, 2000; Sheldon et al., 2001): Fulfillment of three basic psychological needs – autonomy, competence and relatedness – may increase intrinsic environmental motivation and strengthen the engagement in PEB (Wullenkord, 2020). Further, engagement in PEB itself may contribute to the satisfaction of these needs (Kasser, 2009).

Furthermore, various papers find that specific personality characteristics or situational circumstances have positive effects both on behaving environmentally friendly and feeling good. Examples for these so-called double dividends are being mindful, having an intrinsic or altruistic value orientation, feeling connected to nature, or having a good work-life balance (e.g., Andersson et al., 2014; Brown & Kasser, 2005; Navarro et al., 2020). Lastly, Venhoeven et al. (2020) suggest that people perceive engaging in PEB as meaningful, which in turn provides a positive signal about their self-image (Venhoeven et al., 2016). The driver of the relationship between PEB and well-being is therefore one's own "green" perception (Binder & Blankenberg, 2017). According to this last theory, engaging in PEB itself is able to contribute to high well-being levels, suggesting a causal relationship.

5.4 The case of self-image

A close connection between a positive self-image and well-being is well established in psychological literature. Thinking positively about oneself contributes to high self-esteem, the quality of relationships and ability to be productive, whereas a negative self-image can lead to mental health issues such as depression (Patton, 1991; Taylor & Brown, 1988). A person's self-image is among others based on the behaviors a person is engaging in, which send signals about one's inner attitudinal or emotional states and what kind of person one is (Bem, 1972). In this case, engaging in PEB could act as a self-signal about a person's environmental attitudes and ambitions (Venhoeven et al., 2016) leading to positive feelings be-cause people seem to perceive PEB as meaningful (Venhoeven et al., 2020).

These findings provide an important milestone in debunking the view that environmental behavior change always needs to be a sacrifice and allow feeling cautiously optimistic that a sustainable lifestyle may be compatible with individual well-being. However, since it is in fact the environmentally friendly self-image and not the actual performance of PEB that increas-es well-being levels (Binder & Blankenberg, 2017) – even though self-image and performance of PEB are

related as well – a few caveats remain. For instance, it is still unresolved how often and to what extent a person needs to perform which specific behaviors to elicit this positive self-signal and the resulting well-being increase. If a low level of PEB performance already suffices to elicit an environmentally friendly self-image, this could pose a problem for environmental behavior change.

5.5 The role of environmental impact

Among all the behaviors that are understood as pro-environmental – from turning off the water while brushing one's teeth to refraining from air travel – the impact they have on the environment ranges widely. To have a chance at mitigating climate change, it is important to change behaviors with a high impact on greenhouse gas reduction (Nielsen et al., 2021). While engagement in lower-impact behaviors is also beneficial, they will likely not suffice to mitigate climate change. Research on environmental impacts has identified a number of high-impact behaviors, mainly stemming from three consumption categories with especially high environmental impacts on the individual level: food, mobility, and housing (European Environment Agency, 2013; Tukker & Jansen, 2006).

The majority of studies examining PEB and well-being do not focus on these high-impact consumption categories or behaviors. Instead, they often measure multi-item PEB con-structs that are more closely related to environmental attitudes and intentions than actual environmental footprints (Lange & Dewitte, 2019; Markle, 2013). Stern (2000) terms these PEB measures intent-oriented. Intent-oriented environmental research assesses PEB from the standpoint of the consumer: Behaviors are pro-environmental if they are performed with the intention to act pro-environmentally. Often, the intent to behave pro-environmentally, however, fails to translate to smaller ecological footprints – mostly unnoticed by the ones performing the behaviors themselves (Bleys et al., 2017; Moser & Kleinhückelkotten, 2018).

For impact-oriented research, in contrast, environmental intentions only matter indirectly: Behaviors are pro-environmental if they significantly affect one's environmental impact – measured in greenhouse gas emissions or carbon footprints. While intent-oriented measures of PEB can be predicted by environmental attitudes and values, the engagement in high-impact behaviors is more often determined by socio-demographic characteristics and income level (Bleys et al., 2017; Moser & Kleinhückelkotten, 2018). For instance, people with higher incomes tend to live in larger houses or apartments, which require more energy to keep at a comfortable temperature. An understanding of the consequences of high-impact behavior change for individual well-being is therefore essential.

5.6 Current research

For PEB engagement to enhance individual well-being, the behavior a person engages in needs to elicit a positive self-image. It is therefore crucial that the behavior change is voluntary and intrinsically driven by one's own values and attitudes for the behavior to be capable of reflecting on one's own self-image (Venhoeven et al., 2016). However, while environmental behavior change driven by pro-environmental values and attitudes will likely lead to an increase in intentions and low-impact PEB, a significant increase in high-impact PEB – and consequently reduction of greenhouse gas emissions – is unlikely (Moser & Kleinhückelkotten, 2018). A key objective

therefore is to explore whether the previously re-ported positive relationship between PEB engagement and well-being persists when taking into account the environmental impact of the behaviors measured.

To understand the role of environmental impact in the relationship between PEB and well-being, I am currently conducting a meta-analysis. For this paper, I systematically collect and analyze studies investigating the relationship between high- and low-impact PEB with individual well-being – irrespective of whether the studies are environmentally framed. At this point of my research progress, my work opens up a number of further questions. Future research is needed to explore how environmental impact could affect the relationship between PEB and well-being and how effective policy interventions can be designed that address high-impact environmental behavior change while at the same time not compromising individual well-being.

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6 Which Factors Shape Public Climate Policy Support? A Social-Motivational Perspective

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Abstract

Behavioral public policy refers to interventions aimed at steering people's behavior toward broader goals like climate protection. By influencing environmentally helpful and harmful behavior, such policy can play an essential role in creating necessary individual behavior change. For instance, a policy can subsidize public transportation passes or prohibit private motor vehicles in city centers. However, political feasibility depends upon public attitudes and reactions, and decision-makers may be reluctant to implement policies that lack public support. Which factors, then, shape public policy support? This is a central question researched by environmental psychologists. In this piece, we describe and propose an extension to extant perspectives, taking a social-motivational approach to understanding public support for behavioral climate policy. We begin by outlining how characteristics of people and their social surroundings shape policy support. We then describe our own empirical work showing how people's own motivations, as well as their perception of others' environmental behavior, influence whether they support policy to address climate change. In short, our work shows that conceptualizing climate change mitigation as an important personal goal and perceiving others' environmental behavior as insufficient is associated with stronger policy support, beyond environmental attitudes and risk perception. Lastly, we draw on these findings to make suggestions for climate policy framing and communication.

6.1 How Can Public Policy Help Us to Address Climate Change?

Large-scale changes are necessary to protect the climate and ensure that the planet remains inhabitable (IPCC, 2021; Lenton et al., 2019). Individual environmental behavior is central to this change (e.g., Nielsen, 2017), given that everyday actions add up to a considerable cumulative impact on the state of the climate (International Energy Agency, 2020). Behavioral public policy can influence such individual behavior, contributing to collective climate action. In democracies, especially those with elements of direct citizen participation, such as referendums, support is needed for citizens to vote or lobby for climate policies. Moreover, low support for introduced policies may contribute to social division, protests, and unrest (Hay, 2007; Steg & De Groot, 2019). As a result, decision-makers can be reluctant to implement unpopular policies. Given that behavioral climate policy is a valuable tool in fighting climate change, we must understand the factors that affect public support (e.g., van der Linden et al., 2020; Zvěřinová et al., 2014).

6.2 When Do People Support Climate Policy?

Work from various disciplines has identified characteristics of policies and of people that shape public policy support (Zvěřinová et al., 2014). Relevant policy characteristics are perceived effectiveness (Zvěřinová et al., 2014) and fairness (Drews & van den Bergh, 2016), as well as design factors (e.g., push vs. pull measures, that is, level of coerciveness; Attari et al. 2009; de Groot and Schuitema 2012). These characteristics appear to be predictive of policy acceptability across

some major domains, such as food (Gold et al., 2020; Petrescu et al., 2016) and personal finances, with substantial differences in acceptability between domains (Gold et al., 2020). Influential characteristics of people encompass socio-economic and demographic factors (e.g., political orientation and age, Drews & van den Bergh, 2016; Ejelöv & Nilsson, 2020) and psychological variables (detailed below). Please consult Drews and van den Bergh (2016) and Ejelöv & Nilsson (2020) for cross-disciplinary reviews, and Zvěřinová et al. (2014) for a comprehensive report focused on E.U. policy.

6.2.1 Individual Attributes

Regarding psychological attributes, Goldberg and colleagues (2021) identified five major factors shaping U.S. public policy support in a recent large-scale correlational study. People were more likely to support policy to address climate change if they 1) were more worried about climate change, 2) thought they were at risk of negative climate-related consequences, 3) were more certain that climate change was happening, 4) that it was human-caused, and 5) generally saw climate change as a bad thing. These findings converge with research from other countries, pointing to worry, risk perception, and beliefs and knowledge surrounding climate change as core drivers of policy support (e.g., Stoutenborough et al., 2014). In addition to the factors mentioned, people are more likely to support behavioral climate policy if they hold consistent environmental attitudes (Rauwald & Moore, 2002). For instance, those who are more concerned about the state of the environment (Coelho et al., 2017) and those who hold stronger ecological values are more likely to support action to address climate change (Stoutenborough et al., 2014).

6.2.2 Social Phenomena

Of course, people do not act in isolation, but are embedded into social groups and socio-political systems that influence how they think and act. While environmental psychology has traditionally focused on individual characteristics shaping environmental behavior (as listed above), more recent approaches have highlighted social influences. We will explain how social norms, i.e., perceptions of what others think and (should) do, influence individuals' policy support, and how these social norms often derive from our social identities.

First, several studies have found that social norms influence policy support. In this context, social norms reflect people's perception of others' support for climate policies and their motivation to act in line with these others (de Groot & Schuitema, 2012). For instance, an experimental study by de Groot and Schuitema (2012) showed that support for a policy was lower when a minority (instead of a majority) of the public was seen as supporting it (see Figure 3). This effect was particularly pronounced for push as opposed to pull policies (that is, more coercive policies), which tend to be less popular across the board.

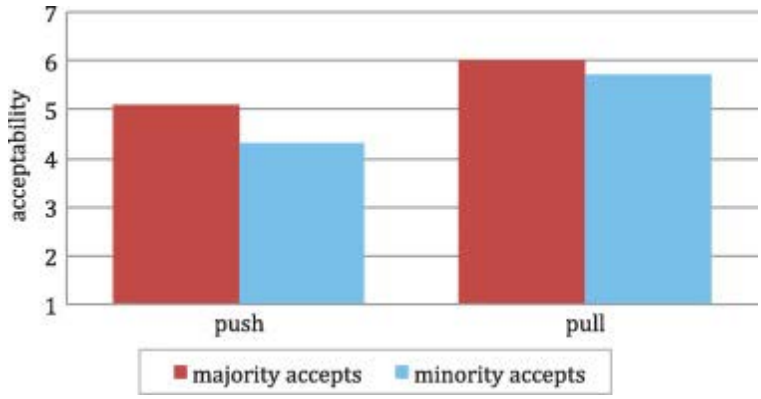

Figure 3: Means of acceptability evaluations depending on the coerciveness of the policy and social norms, reproduced from de Groot & Schuitema (2012)

These findings are mirrored in a more recent study (Rinscheid et al., 2020) which finds that people are less likely to support policy to phase out fossil fuel-powered cars in the face of perceived minority support. This suggests that perceived negative social norms (i.e., minority support) in particular may hinder support, while there is no clear evidence for a beneficial effect of positive social norms.

Given their influence on our behavior, where do these social norms originate? Oftentimes, they derive from our social identities, the identities that stem from our membership in groups. These groups can be broad and pre-determined (e.g., nationality) or chosen (e.g., profession, political identity) and provide implicit and explicit rules and expectations for our attitudes and behaviors (Fielding, 2019). This influence of group norms on behavior is particularly pronounced for groups we strongly identify with (e.g., Fielding et al., 2008; see Fritsche et al., 2018 for a review of social identity in environmental appraisal and response). We observe this phenomenon, for example, in political partisanship, with people supporting the same policies more strongly when they are proposed by their own, rather than the opposing, party (van Boven et al., 2018).

6.3 A Social-Motivational Lens

The social phenomena described above chiefly concern descriptive and injunctive norms, the perception of what others are doing or approve of doing. However, unlike more private areas of life, such as health or relationships, individual environmental behavior affects everyone's quality of life. Therefore, someone's behavior is no longer purely their own concern, but affects other people. While past research has focused on the link between norms and own policy support or environmental behavior, our work focuses on perceptions of the insufficiency of others' environmental behavior (i.e., others are not doing enough to protect the climate) as a factor influencing policy support. Specifically, we are interested in whether people might support behavioral policy as a steering tool, aligning others' as well as their own behavior with environmental goals.

6.3.1 Self-Control

Of course, difficulties in going through with pro-environmental intentions are not limited to other people: environmentally friendly behaviors can be hard to perform and keep up because they require self-control, to surmount competing desires and urges (Kukowski et al., under

review; Nielsen, 2017). For instance, we may desire comfort in taking the car to work, which is at odds with the more environmentally friendly option of taking the bus. This tension between a desire and an incompatible goal is called a self-control conflict (Kotabe & Hof-mann, 2015). By making environmentally harmful behaviors less attractive (e.g., financially costly) or even impossible (e.g., banning environmentally unfriendly options), or facilitating environmentally friendly behaviors, behavioral public policies can reduce self-control conflicts in everyday life and boost environmental outcomes.

6.3.2 A Collective Self-Control Problem

As outlined above, one feature of climate change mitigation that makes it particularly challenging is its dependence on the collective: everyone has to do their part for change to be effective. While a single individual's actions cost resources like time and effort and do not necessarily pay off for that person, combined individual efforts substantially impact environmental quality, benefitting everyone in the end (i.e., also known as "social dilemma", see Hardin, 1968). By incentivizing environmentally helpful behaviors and making environmentally harmful behaviors difficult or impossible, public policy helps us bring together individual contributions to create large-scale change (Figure 4).

Figure 4: Like this flock of thousands of individual starlings gathered in an impressive formation flying South, humans, too, can create substantial aggregate effects through cumulated individual action (© A. Beukhof / Adobe Stock).

We, therefore, suggest that behavioral public policy fills both an individual and a social control function. In terms of individual self-control, government policy makes environmental behavior easier to enact: if cars are banned, the self-control conflict between the desire for comfort and the environmental goal may not arise in the first place. Policy, of course, affects not only the single individual but also those around us: if I can no longer use the car, neither can others. In other words, policy constrains everyone's behavior and can therefore be thought of as a social

control mechanism, ensuring that everyone within the regulatory bounds contributes to the collective environmental effort.

6.4 Results in a Nutshell

We conducted two survey studies that aimed to shed light on whether people's own difficulties in self-control and their perception that others aren't doing enough for climate protection influence their policy support (Kukowski et al., in prep.). Our goals were twofold: in the first study (610 participants), we wanted to test whether people's self-control and their beliefs about others' environmental behavior would be strong predictors of policy support even when taking into account a host of other established factors (e.g., political orientation). We used a technique called elastic net, which is a machine learning algorithm that, in simple terms, selects the strongest predictors out of a pool of candidate variables. In the second study (270 participants), we ran the same analyses in a new group of participants, replicating the results from study 1. Both studies showed that people are more likely to support climate policy when 1) doing something against climate change is an important personal goal – which is an important prerequisite for self-regulatory processes to set in (Kotabe & Hofmann, 2015) – and 2) they think that other people are not doing enough to protect the climate. Might people, therefore, leverage behavioral policy as an instrument to control others' (though not necessarily their own) environmental behavior? We plan to follow up on these surveys with experimental studies, which will allow us to unpack these patterns more closely and to establish directional effects (e.g., perceptions that others aren't doing enough causing people to support climate policy, not vice versa).

6.5 Implications for Policymakers and Communicators

We set out by highlighting the importance of citizen support for behavioral climate policy implementation. We described how various personal dispositions and beliefs, such as worry about climate change and perceptions of what others think and do, influence how likely people are to support policy. We then proposed a social-motivational perspective on climate policy support, outlining how climate change mitigation is a unique problem in that it requires both individual self-control and, simultaneously, the cooperation of many people to be successful. Lastly, we presented our most recent work supporting this idea. We will now briefly outline some suggestions for policy framing and communication that build on the ideas described in this article.

6.5.1 Link to Pro-Environmental Norms

Social-psychological research has shown again and again that people's thought and behavior are informed by what others are doing. A considerable body of research has also applied this phenomenon to the environmental realm, demonstrating that people tend to adapt their behavior to that of their groups. Consequently, providing information that the majority of group members are engaging in the target behavior (e.g., supporting the behavioral policy in question) makes others more likely to adopt the same behavior (e.g., de Groot & Schuitema, 2012; Rinscheid et al., 2020). Recent work has also shown that highlighting pro-environmental behavior change (i.e., dynamic social norms) can be especially effective in encouraging environmentally helpful behavior (Sparkman & Walton, 2017). Such strategies do appear to differ in effectiveness depending on policy characteristics (e.g., level of coerciveness) and should be adapted accordingly. Based on this work, policymakers may consider highlighting favorable norms to their target

audiences, particularly those that are relevant to the targeted group (e.g., positive environmental norms amongst farmers when targeting a farming population, see social identity theory and shared identity messaging, Doell et al., 2021).

6.5.2 Individual Goals

Clearly, people must be concerned about climate change to support policy to address it. However, our work shows that actively holding a goal to contribute to climate change mitigation seems to matter above and beyond the impact of environmental attitudes. These findings are in line with classic research in motivation, which shows that commitment to a personal goal incites action toward attaining it (compare Rubicon model of action phases, Gollwitzer, 1990). Recent work has shown that we can activate goals that people already hold by showing people the relevance of their choices to these goals (Mertens et al., 2020). Given that simply reframing policy in terms of other positive effects (e.g., creating jobs) does not seem to boost public policy support (Bernauer & McGrath, 2016), policymakers might consider making the environmental impact of specific policy proposals as visible as possible to showcase their relevance to personal environmental goals.

6.5.3 Collective Solutions to Collective Problems

Given the nature of climate change as a collective problem in which we depend on each other's actions, it is unsurprising that people are especially watchful of others' behavior. Based on their concern with whether others are doing enough to protect the climate, people may – implicitly or explicitly – think of climate policy as a means of aligning others' behavior with the overall climate action goal (Kukowski et al., in prep.; Kukowski et al., 2021). Of course, our study should not be taken as grounds for communicating false information regarding the sufficiency of others' behavior to increase policy support. Indeed, such a strategy of false information will ultimately backfire, destabilizing democracies and their policy instruments. Instead, we suggest providing accurate information on current shortcomings in environmental behavior. Past research has established that simple changes in wording can have profound impacts on environmental behavior (Cialdini et al., 2015; Panagopoulos & van der Linden, 2016), demonstrating the role of policy communication in moving toward a more sustainable future.

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7 Our decisions linger longer than we do: failures to negotiate on behalf of future generations

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Abstract

Climate change, resource depletion, or biodiversity loss fuel today's conflicts over the man-agement of natural resources (e.g., forest stands, freshwater deposits, rare-earth metals). However, the present generations' decisions do not only have immediate consequences for the involved parties, but also dramatic delayed consequences for future generations. In this article, we highlight the key role of negotiation processes to mitigate sustainability challenges and promote intergenerational welfare. We argue that research and practical intervention approaches are much needed. First, we will illustrate the significance of present joint decision-making for future generations with the example of a recent constitutional court decision. Second, we will give a brief overview of current research on the integration of future generations' interests in the fields of individual and joint decision-making. Ultimately, we will conclude by identifying major barriers toward the integration of future generations' interests in today's joint decision-making as well as two well-established interventions.

7.1 Policy makers fail to integrate future generations' interests into their joint decision-making – a ruling of the German Federal Judge Court

On April 29 2021, Germany's highest constitutional court passed a groundbreaking ruling in the domain of climate protection and intergenerational justice: the Karlsruhe judges declared the German Climate Protection Law that aims at reducing carbon emission until 2050 as unconstitutional and asked the German Government to refine the law within one year. The judges reasoned that the current law only defines concrete measures of reduction until 2030 and leaves open how and to which extent carbon emissions will be further reduced afterwards. Thereupon, the court concluded that the current Climate Protection Law violates the liberty of future generations by postponing burdensome actions into a distant future and by being too vague (Eddy, 2021; Connolly, 2021). When a new law is created in Germany, it must pass various instances (e.g., ministries, interest groups, Bundestag, Bundesrat), where its contents and conditions are negotiated many times. While the passing of the Climate Protection Law in 2019 proved awareness of the consequences of climate change over generations, the law-making instances did not manage to find an efficient and fair solution throughout their intensive negotiations. To put it differently, the good intentions of the present generations' decision-makers failed. Consequently, this decision of the constitutional court leads to an intriguing question: why do present generations' decision-makers fail to include future generations' interests in their negotiations? This question is, of course, relevant not only in the context of policymaking but also to negotiations between individuals, societal stakeholder groups, organizations, or public institutions.

7.2 Research on the integration of future generations' interests in individual and joint decision-making

The conservation and provision of natural resources (e.g., forest stands, freshwater reserves, coal deposits) impose on the responsible decision-makers often an intergenerational dilemma. That is a situation in which "the interests of present decision-makers are in conflict with the interests of future others" (Wade-Benzoni & Tost, 2009, p. 166; Watkins & Goodwin, 2019). For instance, over the last decades, the currently living generations have adapted to frequent flier programs, dumping prices for air travel, last-minute flights, and both short- and long-distance flights. However, our present generations must forego their mobility conveniences to decelerate climate change and maintain secure living conditions for generations to come. Individual decision-making research has already provided deep insights into people's perception and behavior in intergenerational dilemmas (i.e., one's present interests vs. future other's interests). These findings suggest that individual decision-makers show a tendency to focus on their current interests and thereby largely neglect future generations' interests (e.g., Bosetti et al., 2020; Fischer et al., 2004; Hurlstone et al., 2020; Wade-Benzoni, 2002; Wade-Benzoni, 2008; Wade-Benzoni et al., 2012).

However, this research focuses on socially isolated decisions and neglects that the most crucial decisions are often a product of joint, interactive decision processes between different members within present generations. Typically, parties attempt to resolve such interdependent decisions with their present counterpart(s) through negotiation (Walton & McKersie, 1965). Despite the relevance of negotiations, the current state of research on negotiations with an impact on future others is limited to few studies. These studies show that present generations' negotiators have a fundamental tendency to neglect future generations' interests and focus on their respective present interests (Bogacki & Letmathe, 2021; Kamijo et al., 2017; Shahrier et al., 2017). Until now, these studies focus mainly on how to overcome this decisive behavioral tendency and deal only implicitly with an in-depth investigation of the present generations' perception and behavior in joint decision-making. Both Bogacki and Letmathe (2021) and Kamijo et al. (2017) find that adding representatives of the future generations to the negotiation table decreases present negotiators' neglect. Furthermore, Shahrier et al. (2017) showed that evaluating the present generations' decisions from the perspective of the future generations has a similar effect on the present generations' joint decision-making.

Although these studies provide first insights into the psychology of negotiations with an impact on present generations and future others, there is a need for further research concerning several aspects: first, in the current studies, participants were involved in single-issue negotiations. However, in real life, negotiators often face negotiations on multiple issues at the same time, which leads to a higher degree of complexity, but also to the opportunity of mutually beneficial solutions (i.e., integrative solutions) within and across generations. Second, until now, research on negotiations with an intergenerational impact mainly focused on how to overcome or at least diminish present generations' neglect of future generations. However, this practical approach has not been able yet to provide a structured and solid basis for an in-depth investigation of how, why and to what extent present generations neglect the interests of future generations.

Since a structured basis for present joint decisions with an impact on future others has not been established until recently (Majer et al., 2021), research has not fully considered that wide-

reaching global decisions on the conservation and provision of natural resources involve a variety of actors with different interests. This leads to a situation in which "many real-world intergenerational dilemmas are confounded by intragenerational social dilemmas" (Wade-Benzoni et al., 2008, p. 243). Conclusively, as investigated in individual decision-making research, a conflict of interests between the members of present generations and the members of future generations arises on the intergenerational level (e.g., Bosetti et al., 2020; Fischer et al., 2004; Hurlstone et al., 2020; Wade-Benzoni, 2002; Wade-Benzoni, 2008; Wade-Benzoni et al., 2012). Simultaneously, as investigated in negotiation research, members of different groups within present generations are in conflict with each other on the intragenerational level. Until now, negotiation research has mainly focused on the integration of future generations' interests into the present conflict under different boundary conditions (Bogacki & Letmathe, 2021; Kamijo et al., 2017; Shahrier et al., 2017). Neither of the two lines of research fully incorporate the co-occurrence of intergenerational and intragenerational conflicts. Due to this co-occurrence of conflicts, the intergenerational and intragenerational levels are nested within one another and consequently impact one another (see Figure 5; Majer et al., 2021). A framework of interdependent conflicts that has been recently published by our research group (Majer et al., 2021) addresses this gap by bringing both conflicts together. We will summarize the core elements of our framework in the following and hope to provide hereby a structured basis of understanding for barriers toward the integration of future generations' interests, potential interventions, and future research directions.

7.3 The framework of interdependent conflicts

In the context of present generations' negotiations with an impact on future others, our framework of interdependent conflicts (Majer et al., 2021) can serve as a basis for a structured investigation of the interplay of the intragenerational and intergenerational level of conflict. As a novel approach, our model considers that in joint decisions with an intergenerational impact different types of conflicts may occur simultaneously on different levels (see Figure 5), including (1) a present intergenerational conflict (i.e., between groups of the present generation and their respective future successors) and (2) a present intragenerational conflict (i.e., between different groups of the present generation). In some cases (3) a future intergenerational conflict might arise as well between the respective groups of the future generation.

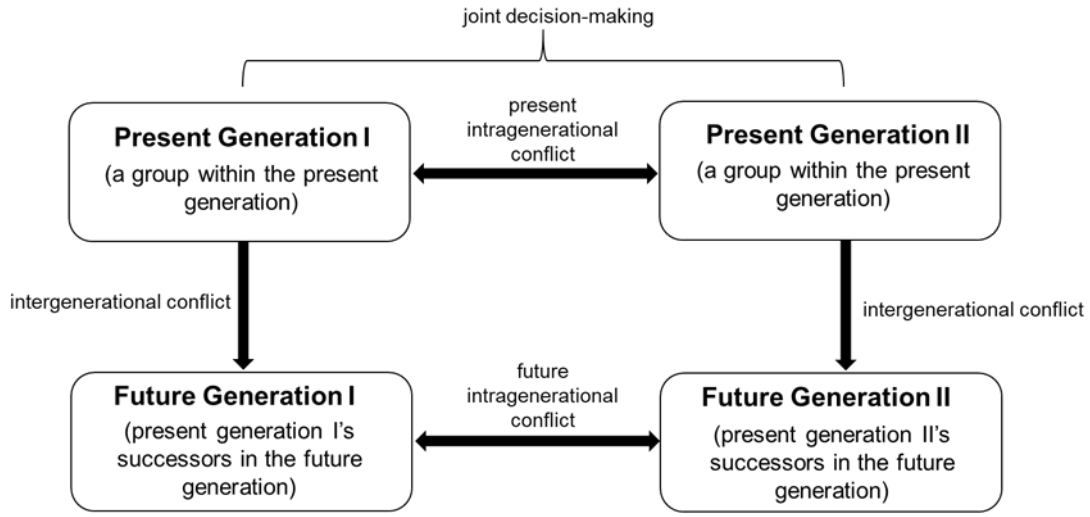

Figure 5: The framework of interdependent conflicts in an intergenerational context adapted from Majer et al. (2021).

First, on a theoretical level, our framework's approach deconfounds the nesting of the intergenerational and intragenerational conflict level and simultaneously considers that both levels of conflict impact one another. Correspondingly, building up on this insight and the identified research gaps, one of our ongoing research projects (van Treek; in prep.) investigates systematically the perception and behavior of present generations' negotiators towards future generations in multi-issue negotiations in the context of resource exploitation. Second, on a practical level, this framework provides an opportunity for negotiators to become aware of the different conflicts that need to be considered and the barriers toward the integration of future generations' interests that lie within these different levels of conflict. As a next step, to provide insights into the psychology of negotiations with an impact on future generations, we will discuss the occurrence of two of the core barriers toward the integration of future generations' interests based on the framework of interdependent conflicts.

7.4 Psychological barriers toward the consideration of future generations' interests in joint decision-making

The above-outlined framework suggests that joint decision-making with an impact on future generations embraces multiple levels of conflict that interact with each other and impact in sum the behavior of present generations' negotiators towards future generations (Bogacki & Letmathe, 2021, Kamijo et al., 2017; Shahrier et al., 2017). Individual decision-making research has identified several crucial barriers that manifest this disillusioning effect (e.g., egoism bias, intergenerational devaluation, lack of reciprocity, decoupling of decision and consequences; e.g., Wade Benzoni & Tost, 2009). In the following, we will delineate two of the most essential barriers that occur in the majority of joint decisions with an impact on future others and have been both transposed and investigated in research many times, namely (1) present generations' egoistic motives and (2) intergenerational devaluation processes. Both of these barriers occur at the intergenerational level. However, it might be that the co-occurrence of intergenerational and intragenerational conflicts in joint decision-making even reinforces the neglect of future

generations' interests by anchoring the present generations' attention and endeavors in the present to solve the conflict with their present counterpart (i.e., the intragenerational conflict).

As a first decisive barrier, present generations' egoism toward future generations plays a crucial role in the neglect of future generations' interests. More precisely, this means that individuals have the fundamental tendency to prioritize the realization of their interests. This barrier of favoring oneself resonates with the structure of intergenerational conflicts, because "[…] the interests of future individuals often conflict with the interests of present decision-makers" (Wade-Benzoni et al., 2010, p. 8). Taking deforestation as an illustrative example, this could mean that present generations might want to cut trees to extend grazing areas and harvest wood. However, future generations would be negatively impacted because a lack of trees would contribute to an acceleration of climate change (e.g., the trees would no longer remove carbon dioxide; Jacquet et al., 2013; Wade-Benzoni & Tost, 2009). Additionally, on the intragenerational level, negotiation research has shown that egocentric interpretations of desirable negotiation outcomes have been proven a robust source of biased self-centered behavior (Babcock et al., 1995; Kriss et al., 2011; Paese & Yonker, 2001; Thompson & Loewenstein, 1992; Wade-Benzoni et al. 1996). This biased perception of desirable negotiation outcomes might be transmitted to the intergenerational level as well. As a consequence, present generations might have the biased perception that their self-centered agreements are a fair and desirable outcome for both themselves and future generations. An ongoing research project within our research group (van Treek et al., in prep.) aims at investigating how far further psychological barriers toward intergenerational justice impact present generations' joint decision-making by excluding egoism motives as a powerful driver.

As a second decisive barrier, present generations' devaluation of future generations (i.e., intergenerational discounting) has been identified in multiple research projects as a driver of present generations' neglect. This devaluation is founded on future generations' social and temporal distance from present generations. On the one hand, this means that the consequences of present generations' joint decision-making manifest only within the far future and will usually not be experienced by present generations' members. This leads to the devaluation of future benefits, called temporal discounting (Frederick et al., 2002; Joshi & Fast, 2013). On the other hand, the consequences of present generations' joint decision-making will not be experienced by themselves, but by future others. As a result, decision-makers tend to focus on achieving benefits for themselves or close others rather than distant others (i.e., the future generations), which is referred to as social discounting (Hurlstone et al., 2020; Jones & Rachlin, 2006). Taken together, the unique co-occurrence of temporal and social discounting, so-called intergenerational discounting, contributes to the tendency of present generations to focus on their present benefits and neglect future generations (Li et al., 2007; Jacquet et al., 2013; Wade-Benzoni, 2008; Wade-Benzoni & Tost, 2009).

7.5 How can we promote the integration of future generations' interests into joint decision-making?

It might seem that the psychological barriers toward the integration of future generations' interests are numerous and challenging to overcome. However, research has already started to investigate a variety of interventions to promote the integration of future generations' interests. As a hopeful conclusion to this article, we will present two of the most widely established

intervention methods that have proven to be effective in recent research, namely (1) the installation of representatives of future generations at the negotiation table and (2) the creation of awareness of precedent generations' beneficence toward present generations.

The devaluation of future generations' interests due to their temporal and social distance from the present negotiators has been identified as a central driver for present generations' neglect (e.g., Bogacki & Letmathe, 2021). As outlined above, as a reply to this barrier, two recent studies in the field of negotiations have shown that the future generations' interests can be made more tangible and therefore less discountable by installing a representative of future generations at the negotiation table. This representative has the task to actively advocate for future generations' interests (Bogacki & Letmathe, 2021; Hara et al., 2019; Kamijo et al., 2017). In a computer-based negotiation study conducted by Bogacki and Letmathe (2021), participants had the task to negotiate with a randomly assigned counterpart (i.e., another study participant) via a chat-tool a scenario on CO2 emissions of a company. It was found that compared to those participants who were in the role of a present executive board member, those who were in the role of an elected representative of future generations actively identified with future generations and advocated for their rights (Bogacki & Letmathe, 2021; Tajfel & Turner, 1986). This advocating for future generations, in turn, led to a significant increase in consideration of future generations' interests. Taken together, in situations in which joint decisions have to be made on issues with an impact on future others, it might be helpful to add a representative of future generations to the negotiation table. Encouragingly, this idea has already started to find its way into policy-making: although not yet installed, the United Nations are discussing the creation of an ombudsperson for future generations (Vincent, n.d.).

Concerning a second potential intervention method, a series of scientific studies from the individual decision-making literature indicates that a reflection of prior generations' beneficent behaviors and good intentions toward the current present generations, increases, in turn, the current present generations' benevolence toward future generations (Bang et al., 2017; Barnett et al., 2021; Wade-Benzoni, 2002;) and makes them refrain from their egoistic motives. A crucial trigger for this intergenerational reciprocity is that present generations retrospectively perceive their predecessors' behavior toward them (i.e., the current present generations). The present generations derive from this observation a norm of behavior toward their successors (Wade-Benzoni, 2002). On a psychological level, a set of studies by Bang et al. (2017) showed that present generations with beneficent predecessors experienced a higher level of feelings of stewardship toward their successors (i.e., the willingness to subordinate one's interests to others' longterm interests, Hernandez et al. 2012). The authors concluded that present generations with beneficent predecessors mirror a sense of stewardship that they attribute to their predecessors (Bang et al., 2017). Conclusively, before entering negotiations with an impact on future others, it might be helpful for all participants to consider themselves as a part of a stream of generations and reflect upon how the achievements and beneficence of prior generations have affected their lives positively.

7.6 Conclusion

Joint decisions with consequences far beyond the negotiators' lives represent a core element of intergenerational justice, especially now that humankind is confronted with issues such as climate change, resource depletion and biodiversity loss. This article aimed at providing both an

overview of the state of knowledge on and practical applications for dealing with intergenerational joint decision-making. Despite the importance of negotiations with an intergenerational impact in maintaining the habitability of our planet for future generations, little research has been done on the perceptions, behaviors, and motives of negotiators in an intergenerational setting. An ongoing research project by our group seeks to bridge this gap by conducting empirical research that examines the behaviors and psychological underpinnings of negotiators of present generations (van Treek et al., in prep.). Some of this project's central questions are: whether and to what extent do present generations' decision-makers neglect future generations' interests in negotiations on environmental resources? What are the decisive psychological barriers toward intergenerational justice and how robust are they?

However, to fulfill the societal need of promoting the pathway toward intergenerational justice, further research exceeding this research project is required. Future studies could for example gain more insights into the psychological barriers that negotiators face and that prevent them from benefitting others in the future. Furthermore, additional intervention methods tailored to a negotiation setting should be developed.

On a last note of this article, the authors would like to emphasize that sustainability challenges around the globe have made apparent what was always an integral part of human existence: each generation of homo sapiens is torn between satisfying the diverse interests of its generation (i.e., an intragenerational dilemma) and the interests of future generations (i.e., an intergenerational dilemma). Meanwhile, every generation also builds up on what previous generations have achieved and destroyed. In times when the living conditions of our successors are more and more at stake, we should consciously locate ourselves in this intergenerational stream and become aware not only of our joint decisions' impact on ourselves but also on countless other future human beings.

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