Behavioral Insights for the Common Good: Consumer Decision-Making and (Unintended) Effects of Behavioral Interventions in the Context of Behavioral Public Policy and Social Marketing

Dissertation

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Vorgelegt
von
Lisa-Marie Arnold
aus Amberg

Dekan:	Prof. Dr. André Meyer
Erstberichterstatter:	Prof. Dr. Claas Christian Germelmann
Zweitberichterstatter:	Prof. Dr. Mathieu Kacha
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"Once we know that people are human and have some Homer Simpson in them, then there's a lot that can be done to manipulate them."

— Cass Sunstein

Geleitwort

Nur wenigen Dissertationsschriften ist es vergönnt, ein neues Feld für eine Disziplin erschließen zu können: Die Arbeit von Frau Dr. Arnold (geb. Merkl) ist eine dieser großen Ausnahmen. Es gelingt Frau Dr. Arnold dabei, zwei Forschungsstränge im Marketing zusammenzuführen: Frau Arnold liefert einen wertvollen Beitrag zu Wirkungsmustern im Non-Profit-Marketing, und führt dabei zugleich das neue Konzept der „Behavioral Public Policy“ in die Diskussion des Fachs Social Marketing ein. Wer sich wie Frau Arnold Fragestellungen widmet, deren abhängige Variable im weitesten Sinn das „Common Good“ ist, muss stets zwischen der Skylla der definitorischen Unschärfe des Guten und der Charybdis des Paternalismus navigieren. Frau Arnold löst dieses Dilemma höchst erfolgreich, indem sie überzeugend zeigt, dass Verhaltensinterventionen so gestaltet werden müssen, dass sie zur Überwindung von systematischen Verzerrungen dienen können. Auf diese Weise helfen die Interventionen den Individuen, ihre eigenen Ziele zu erreichen. Diese Perspektive mit der Zielorientierung der Konsumentinnen und Konsumenten als Leitstern ermöglicht es ihr, kompetente Vorschläge zu machen, wie die in der Konsumentenverhaltenstheorie wie in der Marketingpraxis gefürchtet Attitude-Behvior-Gap zu überwinden sein kann.

Eine wesentliche Leistung der Dissertationsschrift von Frau Doktor Arnold ist es, die Theoriewelt der Behavioral Economics mit der der Konsumentenverhaltensforschung zu verbinden. In ihren wissenschaftlichen Fachartikeln und im ausgesprochen lesenswerten Rahmen gelingt es ihr, ohne unzulässige Vereinfachungen den common ground beider Theoriewelten aufzuzeigen und daraus innovative Hypothesen abzuleiten.

Frau Doktor Arnold hat mit ihrer kumulativen Dissertation eine in Breite und Tiefe sehr starke Forschungsleistung demonstriert. Es gelingt ihr, nicht nur verschiedene Problemfelder aus dem Themenkreis der Behavioral Interventions kompetent empirisch zu untersuchen, sondern durch ihre Untersuchungen und den Rahmen den umfassenden Themenkreis der Behavioral Policy auszuleuchten. Ein besonderes Verdienst dieser Dissertation ist es, dass reflektiert und kritisch mit Empfehlungen umgegangen wird, die zum Standardrepertoire der Behavioral Economics gehören: Frau Doktor Arnold entschlüsselt beispielsweise in ihrem Beitrag zu Traffic-Light Labels erstmals, unter welchen Bedingungen diese Label entgegen den Erwartungen gerade eben nicht funktionieren.

Die vorliegende Dissertationsschrift ist eine ganz besonders gelungene wissenschaftliche Arbeit. Frau Doktor Arnold hat mit ihrer Dissertation überzeugend dargelegt, dass sie zu hervorragenden eigenständigen akademischen Leistungen auf dem Gebiet des Marketing, der Konsumentenverhaltensforschung und der Behavioral Policy in der Lage ist. Mit der Breite der Fragestellungen und dem hohen methodischen Anspruch, wie auch mit der klugen Einordnung der Studien in das neu erschlossene Feld der Behavioral Policy hat Frau Doktor Arnold eine ganz hervorragende Leistung vorgelegt.

Es war mir eine besondere Ehre, den Weg bis zu dieser Publikation begleiten zu dürfen. Ohne Zweifel wird die Dissertationsschrift von Doktor Lisa-Marie Arnold zu den Schlüsselbeiträgen zum „Behavioral Policy Turn“ in der Forschung zum Social Marketing gehören: Ihr Zugang zur Überwindung des Attitude-Behavior-Gap durch die Verbindung von Interventionskonzepten aus den Behavioral Economics und den Mechanismen, die die Konsumentenverhaltensforschung etabliert hat, eröffnet ganz neue Zugänge im Marketing für soziale Zwecke. Interessierten Forscherinnen und Forschern, aber auch Praktikerinnen und Praktikern, nicht zuletzt aber auch der Verbraucherpolitik, sei dieses Werk sehr ans Herz gelegt.

Bayreuth, im Juni 2024

Prof. Dr. Claas Christian Germelmann

Acknowledgments

I would like to take this opportunity to express my gratitude to the people who accompanied me on my journey as a doctoral student and without whom the completion of this thesis would not have been possible.

First, special thanks to my supervisor, Prof. Dr. Claas Christian Germelmann, who always supported my projects with fruitful feedback and helped me grow as a researcher and person. Thank you for trusting and supporting my ideas. Thank you for providing me with opportunities for personal development during the last few years. I would also like to thank Prof. Dr. Mathieu Kacha, who not only inspired me on my PhD journey with great ideas for my research project but also served as my co-supervisor.

Further, I want to express my gratitude to my colleagues at the chair for marketing and consumer behavior. Thank you so much for the valuable discussions on research topics and the mental support you gave me, especially in the last few months. I also want to thank my colleagues at the Department of Food Science and the Department of Psychology at the University of Copenhagen for giving me the opportunity for a research stay and integrating me into their research projects. Thank you so much for all the new learnings and inspiring experiences.

One of the most essential companions on my journey have been my friends, who always make me laugh even on bad days and have encouraged me every day to achieve my goals. You are making the good times better and the hard times easier. From the bottom of my heart, I would also like to take this opportunity to thank my entire family, especially my beloved parents and sisters: So much of me is what I have learned from you. Thank you for your unconditional love and support every single day of my life. Thank you for giving me wings, without which I would never have been able to start and complete this journey. It is a blessing to have you all by my side.

Above all, my greatest *thank you* goes to my future husband, Laurin, with whom I started this journey together in April 2020. Having you by my side, no feedback felt too hard, no deadline too tight, no challenge too big. Thank you for encouraging me to keep going, for your understanding, and for your unconditional love. So, I promise this will not be the last journey we start and complete together.

Bayreuth, February 2024

Lisa-Marie Merkl

Abstract

Although consumers may follow good intentions for a healthy and pro-environmental lifestyle, reality reveals a gap between behavioral intentions and actual behavior. One approach for bridging this gap is the implementation of behavioral interventions, which represent a promising tool for changing consumer behavior. Especially, non-regulatory behavioral interventions are often used both in behavioral public policy by governments or as part of social marketing strategies. Previous research provides evidence on the effectiveness of different types of non-regulatory behavioral interventions in different application contexts and areas, yet the results are mixed. However, compared to regulatory behavioral interventions, non-regulatory behavioral interventions offer a promising tool to affect behavior via measures that are often implemented quickly and cost-effectively and do not restrict the target group's freedom of choice. However, this requires an understanding of whether and under what circumstances non-regulatory behavioral interventions are effective. Hence, drawing from the literature as well as from a public policy and marketing perspective, there is a call for a deeper investigation of the question of how effective different types of behavioral interventions are in different application areas and application contexts and how potential unintended or lacking effects can be explained. Taking a behavioral economics perspective, this thesis follows a transformative consumer research approach using quantitative, qualitative, and mixed research methods both in field and laboratory settings. Findings from the studies conducted within six research articles (integrated into this thesis) highlight the importance of understanding 1) the unpredictability of the effects of behavioral interventions, 2) interpersonal characteristics and preferences in the decision-making process as well as 3) context-specific factors, and 4) the underlying mechanisms of behavioral interventions. Accordingly, this thesis provides a “reality-check” of selected behavioral interventions, offers insights into the underlying decision-making mechanisms, and provides explanations on lacking or unintended effects of such interventions in different application contexts and areas. Thereby, this thesis makes important empirical and methodological contributions. Moreover, it offers valuable recommendations for theory and practice for the use of behavioral insights for the common good and for (further) development of successful behavioral interventions in the context of behavioral public policy and social marketing.

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List of Abbreviations

ACAA	Application Context-Application Area
RA	Research Article
RQ	Research Question
TCR	Transformative Consumer Research
VR	Virtual Reality

1 Making the world a better place by using behavioral interventions

Imagine all of us transforming good intentions into actual behavior day by day. Imagine all of us acting on good intentions for a healthy and pro-environmental lifestyle. Imagine people not only claiming their intention to follow a healthier diet, consume less meat, or be more responsible in energy consumption but actually doing it – both for their own and the common good. Wouldn't the world be a better place?

Unfortunately, reality is different. In this world, we are facing health and environmental crises that seem increasingly impossible to overcome. Temperatures are rapidly increasing to more than 1.5 degrees Celsius, and we are heading for a climate catastrophe triggered by human-made greenhouse gas emissions, for example, from the production of meat-based products or the combustion of fossil fuels (European Commission, 2023). The World Health Organization (2023) emphasizes that this will profoundly affect our environment and health: "Climate change presents a fundamental threat to human health." Moreover, preserving human health is also facing a human-made crisis, namely overweight and obesity (World Health Organization, 2021). Resulting from poor diets that often conjoint with physical inactivity, around 54% of adults in Germany have already been classified as overweight in 2019 (Schienkiewitz et al., 2022). Since overweight is considered a significant risk factor for the development of (non-communicable) diseases, we are increasingly facing a health crisis of obesity in the Western world (World Health Organization, 2021). In summary, we are in the midst of human-made global health and climate crises - caused by different forms of human misbehavior. Paradoxically, most consumers are well aware of these crises; some even express intentions for better behavior. At the same time, however, they fail to translate these behavioral intentions into actual behavior.

According to a recent representative nutrition study in Germany, for example, 92% of respondents stated that they consider healthy eating very important, while 72% said that sustainability plays an essential role in their food choices (Techniker Krankenkasse, 2023). This contrasts with the reality, which shows that more than half of the population in Germany is considered overweight (Robert Koch Institute, 2022), along with 78% who regularly consume meat (Techniker Krankenkasse, 2023). From a behavioral economics perspective, this raises critical questions:

What causes this gap between behavioral intention and actual behavior? And which tools and approaches can be used to bridge this intention-behavior gap?

Part of the answer to the question of how this intention-behavior gap arises can be found in the fact that human decisions are not made purely rationally but often intuitively, influenced by biases, using simple heuristics that often lead to systematic errors in decision-making (Chaiken, 1980; Tversky & Kahneman, 1974). Accordingly, it is crucial to find a way to trigger good behavioral intentions and to translate them into actual behavior by applying suitable approaches, especially from a social marketing and public policy perspective. One possible approach to improving consumer behavior can be found in behavioral interventions, which can be implemented at an individual, community, or national level to change existing behavior or encourage novel behavior (Cutler, 2004). Using different *types of behavioral interventions* (e.g., labeling of food products), social marketers and public policymakers can address systematic errors in multiple *application contexts* (e.g., health or sustainability). Behavioral interventions can be used in analog, digital, and virtual reality and thus in different *application areas* aiming to provide consumers help for helping themselves and thus bridge the gap between behavioral intentions and intended behavior. This thesis follows a conceptual framework - named *Application Context– Application Area* (ACAA) matrix (Figure 1) - in which the research articles included in this thesis will be embedded.

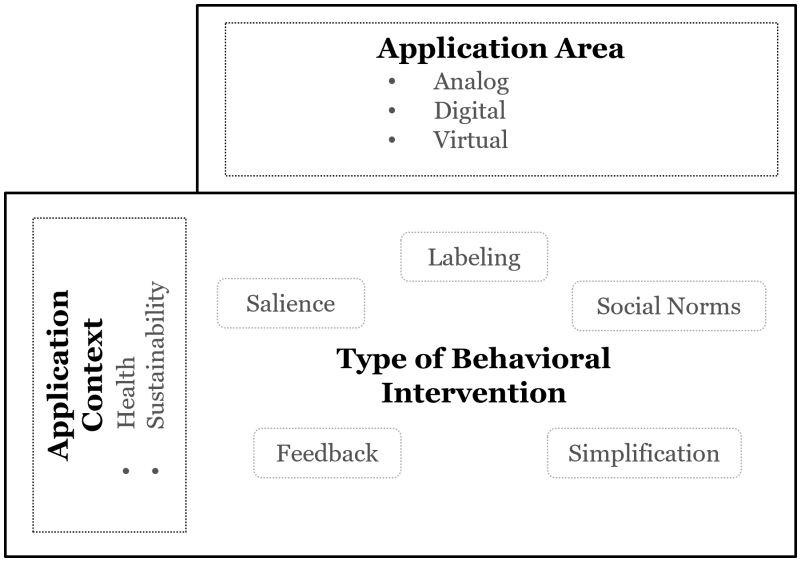


Figure 1. Types of behavioral interventions - examined within this thesis - presented in the Application Context-Application Area matrix

Source: Own illustration

In particular, non-regulatory behavioral interventions are of great interest to public policymakers and social marketers as they do not restrict consumers' freedom of choice. Numerous studies have been conducted to test the effectiveness of such behavioral interventions, looking at different types of interventions in different application contexts and areas. While some studies showed promising effects, others showed no or unintended effects on consumer behavior (for a review, see, e.g., Hummel & Maedche, 2019; Mertens et al., 2022). Looking at mixed results, it is crucial to explore underlying decision-making mechanisms and uncover reasons for unintended or lacking effects. Therefore, using quantitative research methods to examine effectiveness, on the one hand, as well as qualitative research methods to explore underlying mechanisms in depth, became highly relevant. Researchers, public policymakers, and marketers are calling for research on behavioral interventions, their effects on actual behavior, and understanding their mechanisms of action. Against this backdrop, this doctoral thesis addresses the following overarching research questions (RQs):

RQ 1) How effective are different *types of behavioral interventions* in different *application areas* and *application contexts*?

RQ 2) How can (*unintended or lacking) effects* of behavioral interventions be explained?

These RQs are informed by overarching philosophical research paradigms. On the one hand, investigations follow a positivist-(postpositivist) research paradigm aiming to find explanations for consumer behavior, mainly using experimental designs (Kroeber-Riel & Groeppel-Klein, 2019). However, to address the RQs from different perspectives, it is not mandatory to focus on a single research paradigm but on different or mixed approaches (Bowling, 2023; Durdella, 2019). Therefore, investigations further follow an interpretative research paradigm. Within this, in order to get a better understanding of "the meaning that individuals attribute to experiences in their world" (Durdella, 2019, p. 105), investigations incorporate a phenomenological research tradition, which is mainly applied to qualitative methods (Durdella, 2019). Chapter 3 provides a detailed argumentation for and assessment of the selected research paradigms and associated research traditions.

To sum up, *what we know* from the literature is that non-regulatory behavioral interventions, in particular, are often used by public policymakers and social marketers as a tool to guide behavior in various application areas and contexts for the common

good. *What is still missing*, though, is a deeper understanding of when and why behavioral interventions might work or lead to the desired behavior or undesired behavior, i.e., having no or even unintended effects. *Why it is important* to close this knowledge gap is the fact that, compared to regulatory behavioral interventions, non-regulatory behavioral interventions offer a promising tool to affect behavior via measures that are often implemented quickly and cost-effectively and do not restrict the target group's freedom of choice. Yet, this requires an understanding of whether and under what circumstances non-regulatory behavioral interventions are effective.

Following this line of thought, this thesis examines behavioral interventions as a tool in social marketing and public policy for promoting healthy and pro-environmental lifestyles. Within six research articles, selected types of behavioral interventions in different application areas are tested and evaluated. The articles can be regarded as independent research projects. Although they all deal with the superordinate questions of the effectiveness of behavioral interventions along with the underlying mechanisms explaining the (lacking or unintended) effects using quantitative and qualitative research methods or combining both methods in a mixed-method approach. The study findings not only provide insights into how different types of behavioral interventions can be used for the common good in the analog, digital, and virtual world; they also show limitations but also offer new possibilities for improvements based on the insights into the effectiveness and the underlying mechanisms of behavioral interventions. The behavioral insights gained within this thesis are therefore not only highly relevant from a marketer and public policy perspective but also make important empirical and methodological contributions to transformative consumer research.

This thesis proceeds as follows: In Chapter 2, important theoretical concepts on the emergence of the intention-behavior gap and the use of behavioral interventions in behavioral public policy and social marketing are introduced. This is followed by a step-by-step derivation of the ACAA matrix in Chapter 3. Subsequently, emphasis is put on the transformative consumer research approach and the use of quantitative, qualitative, and mixed research methods in testing and evaluating behavioral interventions in Chapter 4. Chapter 5 presents the articles included in this doctoral thesis. Based on the insights gained within these articles, empirical and methodological contributions are outlined. The thesis concludes with recommendations for future research, implications for public policy and marketing, and an overall conclusion.

2 Behavioral insights for the common good: Bridging the gap from intentions to behavior

2.1 Why consumers need help in making decisions

2.1.1 Bounded rationality and systematic errors in consumer choice

"The capacity of the human mind for formulating and solving complex problems is very small compared with the size of the problems whose solution is required for objectively rational behavior in the real world - or even for a reasonable approximation to such objective rationality." (Simon, 1966, p. 198)

Traditionally, neoclassical economic theory, often known as the Bayesian rationality approach, holds that human decision-making is based on purely rational considerations, under full attention, comprehensive information, unlimited cognitive abilities, and without the influence of emotions (Dhami & Sunstein, 2022). In contrast, the notion above by Simon (1966) is based on a more realistic understanding of the human decision-making process, in which no longer a purely rational decision-maker is assumed but rather "a choosing organism of limited knowledge and ability" (p. 256) – characterized as a person of *bounded rationality*. The theory of bounded rationality can be seen as an alternative perspective to the standard economic model and represents an important concept within behavioral economics for explaining behavioral patterns (Cartwright, 2014). In this regard, Simon (1966, p. 243) states the problem of interactions between "internal as well as external constraints."

Internal influential factors can be described as the "properties of the human information-processing system" (Bettman et al., 1998, p. 187). These include, for example, individually prevailing preferences and multiple - sometimes competing - goals (Bettman et al., 1998), individual skills and abilities (Ajzen, 1985) as well as expectations based on past experiences and emotions (Ariely, 2008), which shape human decision-making. In addition to the internal constraints, the *external* influential factors describe "properties of task environments" (Bettman et al., 1998, p. 187). External influencing factors, in turn, describe the factors induced by the environment, such as the information available, social norms, and the time frame or opportunities relevant to the decision (Ajzen, 1985).

As internal and external factors differ between individuals and contexts, they often result in uncertainty for the decision-maker, which may complicate the decision-making process (Kahneman et al., 1982). Mertens et al. (2022) identified three fundamental psychological barriers in the decision-making process that result from individual external and internal factors for the decision-maker: 1. limited access to decision-relevant information, 2. limited capacity to evaluate and compare choice options, and 3. limited attention and self-control. To overcome those barriers and to make decisions with minimal cognitive effort, people often rely on well-known heuristics (Chaiken, 1980). As part of this strategy, these heuristics function as "rules of thumb" (Hutchinson & Gigerenzer, 2005, p. 98) or "mental shortcuts" (Blumenthal-Barby, 2016, p. 5) and are used to make decision-making processes "more quickly, frugally, and/or accurately than more complex methods" (Gigerenzer & Gaissmaier, 2011, p. 454). While heuristics simplify decisions on the one hand, they can also lead to cognitive biases as the underlying, comparatively abbreviated thought model introduces predictable, *systematic errors* (Tversky & Kahneman, 1974). In literature, the terms "heuristics" and "cognitive biases" are often used interchangeably, though Gonzalez (2017, p. 251) underscores the difference between the terms as follows: "heuristics are the 'shortcuts' that humans use to reduce task complexity in judgment and choice, and biases are the resulting gaps between normative behavior and the heuristically determined behavior." Dhami & Sunstein (2022, p. 265) emphasize that the term bias is not to be interpreted as “incompetence or shortcoming on the part of individuals, other than to say that their behavior is different” from Bayesian rationality approach. In their initial work on biases and heuristics, Tversky and Kahneman (1974) characterized three main types of heuristics (representativeness heuristic, availability heuristic, adjustment, and anchoring heuristic) and outlined related biases in the decision-making process. Since then, many more heuristics and biases in various decision-making contexts have been identified (e.g., Blumenthal-Barby, 2016; Mirsch et al., 2017).

The use of heuristics and the occurrence of biases may lead to systematic errors, which can be understood as a barrier to translating individual behavioral intentions into intended behavior. In other words, the natural flaws in human cognition often hinder consumers from behaving the way they would like to. The emergence of this so-called intention-behavior gap due to systematic errors will be explained below using examples in the contexts relevant to this thesis - health and sustainability.

2.1.2 The intention-behavior gap as an obstacle to making healthy and pro-environmental decisions

According to the theory of planned behavior and the theory of reasoned action, actual behavior can be predicted by *behavioral intentions* (which in turn are influenced by attitudes and subjective norms as well as perceived control over the behavioral performance) (Ajzen, 1985; Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). However, reality shows that consumers declare their positive intentions, for example, towards a healthy and pro-environmental lifestyle, but often do not behave accordingly (e.g., Brand & Rausch, 2021; Schaeufele & Janssen, 2021). In the literature, this discrepancy is referred to as the *intention-behavior gap* (Carrington et al., 2014; Sheeran & Webb, 2016). There are several terms, e.g., attitude-behavior gap (Moser, 2015), green gap (Gleim & Lawson, 2014), or ethical-consumption gap (Carrington et al., 2016), which essentially address the same phenomenon. This thesis will consistently rely on the term "intention-behavior gap."

The intention-behavior gap has been widely studied in various contexts[1], including health - especially concerning food consumption (e.g., Vermeir & Verbeke, 2006) and physical activity (Mohiyeddini et al., 2009) - or in the context of sustainability - including green consumption (e.g., Johnstone & Tan, 2015; Nguyen et al., 2019). From a behavioral economics perspective, the question arises of which context-specific constraints in the decision-making process, causing the intention-behavior gap, must be considered. Some researchers argue that heuristics and biases in the decision-making process offer a possible explanation for systematic errors and, thus, the occurrence of the intention-behavior gap (e.g., Dowling et al., 2020; Sunstein, 2014). For example, one result of limited access to decision-relevant information and the limited capacity to evaluate and compare options in the moment of choice could be consumers' tendency to be *present biased*. Another bias closely related to the barrier of limited attention and self-control is *absent-mindedness*. Concerning the intention-behavior gaps arising in health and sustainability contexts, which are in focus within this thesis, the following section outlines those two examples of cognitive biases in these contexts.

[1] More information on studies in other contexts can be found in chapter 2.3.1.

Present bias in goal conflict situations

When making decisions in the health and sustainability context, consumers are often confronted with trade-off scenarios in which individual, competing, often time-inconsistent preferences and goals (e.g., satisfaction of short-term pleasure vs. consideration of long-term conservation of health/environment), which ought to be counterbalanced in the decision-making process (Bettman et al., 1998; Trope & Fishbach, 2000). In such *goal conflict situations* (Stroebe et al., 2017) - as it will be referred to for the remainder of the thesis - consumers systematically tend to overvalue immediately available rewards in the present over delayed rewards in the future, a phenomenon known as the *present bias* (also known as hyperbolic discounting) (Laibson, 1997; Lynch & Zauberman, 2006; O'Donoghue & Rabin, 2000). An example of the present bias in the context of health-related decisions is food choices, such as the choice of a lunch menu in a canteen (Liu et al., 2014). Consumers are presented with a variety of dishes for immediate consumption from which they have to choose the option that fits best with their short-term goals (e.g., satisfaction of pleasure and hunger) and their long-term goals (e.g., healthy lifestyle) at the point of sale (Chance et al., 2014). However, consumers often face options that only meet one of the two goals and thus involve them in a goal conflict. Coupled with internal factors such as a lack of self-control, the present bias tempts consumers to make decisions (e.g., unhealthy food choices) that are incongruent with their long-term goals (Duckworth et al., 2018).

Moreover, the present bias also occurs in the context of sustainability (Hepburn et al., 2010). Since the long-term impact of pro-environmental actions does not manifest to consumers immediately after their decision, they often prefer decisions with immediately available rewards (Fauville et al., 2020). For example, while consumers can actually feel the effects of their actions in the short term after lowering the temperature in their home or can immediately enjoy meat-based meals, the long-term, adverse environmental effects of their actions are not conceivable for some, as these lie too far in the future. The reduction of meat consumption and savings in energy consumption are prototypical of situations in which pro-environmental behavior is associated with perceived losses for consumers in the present with intangible long-term positive effects (e.g., environmental benefits) for consumers.

Absent-mindedness in habitual or information-laden situations

While the present bias often refers to conscious decisions (e.g., for or against a food product), there are also subconscious decisions that can be distorted by contextual factors, potentially leading to unintended behaviors. One example is the rules of conduct established during the COVID-19 pandemic, such as keeping the recommended minimum distance from other people in the public. Although consumers were aware of the relevance of adhering to the minimum distance and the possible (individual and collective) consequences of non-compliance, it became apparent that this intended behavior was not consistently adopted (Harnischmacher et al., 2024). Non-compliance with the minimum distance, therefore, does not result from a conscious decision. It is instead a result of *absent-mindedness*, which usually occurs in information-laden situations in which attention is focused on information for making conscious decisions (Reason, 1984). Absent-mindedness also emerges in habitualized decision-making situations or highly familiar choice environments (Reason, 1984). Again, food choices, often based on past experiences and existing habits, could be recalled here (Chance et al., 2014).

At this point, it should be noted that the present bias and absent-mindedness are merely two examples of a series of biases that may occur in health and sustainability-related choice situations. One approach to overcome the intention-behavior gap induced by heuristics and biases is the implementation of behavioral interventions, which will be introduced in the following.

2.1.3 Bridging the intention-behavior gap by using behavioral interventions

"When these biases and heuristics are present in decision making, efforts should be made to remove, mitigate, or counter them." (Blumenthal-Barby, 2016, p. 5)

At the end of this chapter, previous remarks on the occurrence of the intention-behavior gap will be summarized (Figure 2). Starting with the problem of humans' bounded rationality resulting from the interplay of internal and external factors, consumers are often biased in their decision-making or tend to use heuristics to simplify decisions, which in turn can lead to systematic cognitive errors and, thus, unintended behavior (see Figure 2; red (lower) path).

Systematic errors represent the gap between the behavioral intention and the intended behavior. They can thus lead to behaviors that are not in line with consumers' individual preferences, values, or goals. The success of heuristics is highly dependent on the decision-making context and consumers' ability to use them correctly (Gigerenzer & Gaissmaier, 2011).

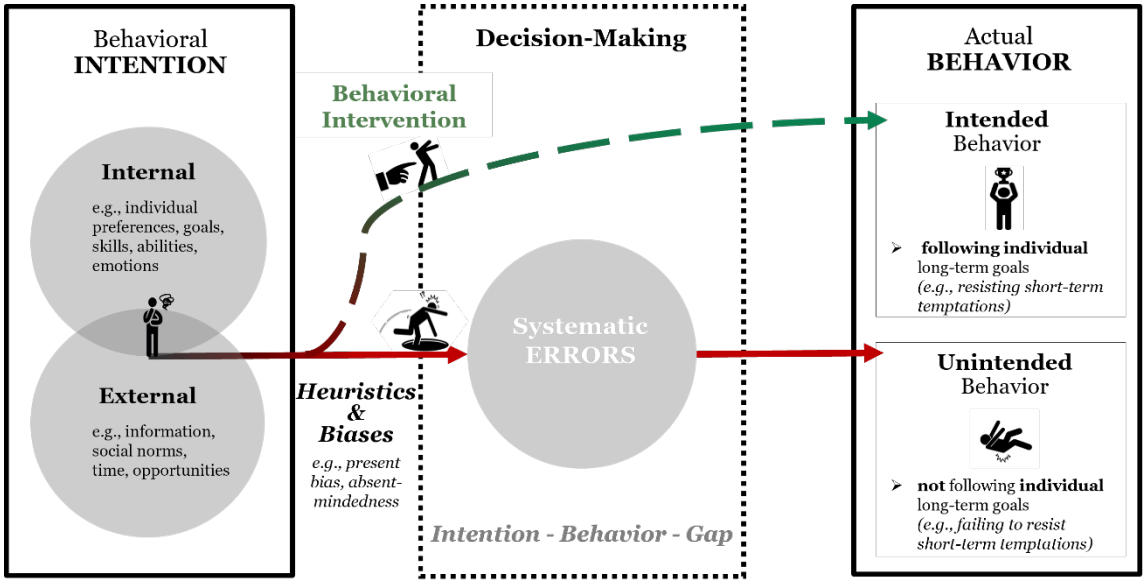


Figure 2. Occurrence and bridging of the intention-behavior gap

Source: Own illustration

As described by Blumenthal-Barby (2016, p. 5), "efforts should be made" to counter the problem of bounded rationality in decision-making. Insights into bounded rationality in the human decision-making process and the systematic errors in the process have also aroused particular interest in behavioral economics. In this regard, social marketers and public policymakers advocate using evidence-based behavioral interventions (see Chapter 2.2), which are intended to aid consumers in overcoming the intention-behavior gap. That is, to build a *bridge from behavioral intentions to intended behaviors* (see Figure 2; green (upper) path). As behavioral interventions are designed to tackle systematic errors in decision-making, they offer a promising approach to promoting healthy and pro-environmental behaviors. The following chapter will explain the use of behavioral interventions as an instrument for public policy or a tool within a social marketing strategy.

2.2 Behavioral interventions: Using insights from behavioral economics for the common good

"If people make systematic errors, perhaps government has, more often than anti-paternalists think, good reason to override their choices. (..) An understanding of systematic errors might help show how and why this is so, and give a sense of what might be done by way of response." (Sunstein, 2003, p. 752)

As noted by Sunstein (2002; see also Thaler & Sunstein, 2008), private and public institutions ought to use knowledge about consumers' flawed decision-making processes to change individual behavior in order to bridge the gap between intentions and behavior (Hansen et al., 2016). In this regard, behavioral economics provides a perspective that combines elements from psychology and economics to apply behavioral insights to economics (Camerer et al., 2004; Cartwright, 2014). The findings of Tversky and Kahneman (1974) on heuristics and biases in decision-making are considered a milestone in the development of behavioral economics (Camerer et al., 2004). Focusing on the use of behavioral insights towards the enhancement of the common good, the subsequent chapters first examine the relationship between (social) marketing and (behavioral) public policy and the strategies and tools used within these disciplines (2.2.1) before conceptualizing the use of behavioral interventions as a tool for behavior change (2.2.2).

2.2.1 Relationship between (social) marketing and (behavioral) public policy

In order to change consumer behavior, a wide range of marketing and public policy tools are already being used (for the following paragraph, Andrews et al., 2022). Marketing and public policy are closely related in the sense that both practices impact consumers and society. Moreover, public policy often affects companies' marketing practices, yet studies on public policy also result in implications for marketing, both in theory and in practice. *Public policy* describes measures to deal with public problems, primarily arranged by governments (Rinfret et al., 2022). *Behavioral public policy* uses insights from behavioral economics to develop policy measures (Oliver, 2013a; Straßheim, 2020). Although there is a relationship between marketing and public policy, as described above, the techniques of behavioral public policy differ from *social marketing*, which is a distinct discipline of marketing concerned with the problems of society (Andreasen, 1994; Cheng et al., 2011; Lee & Kotler, 2011; Lee et al., 2011).

Figure 3 provides definitions and a summarized comparison of behavioral public policy and social marketing.

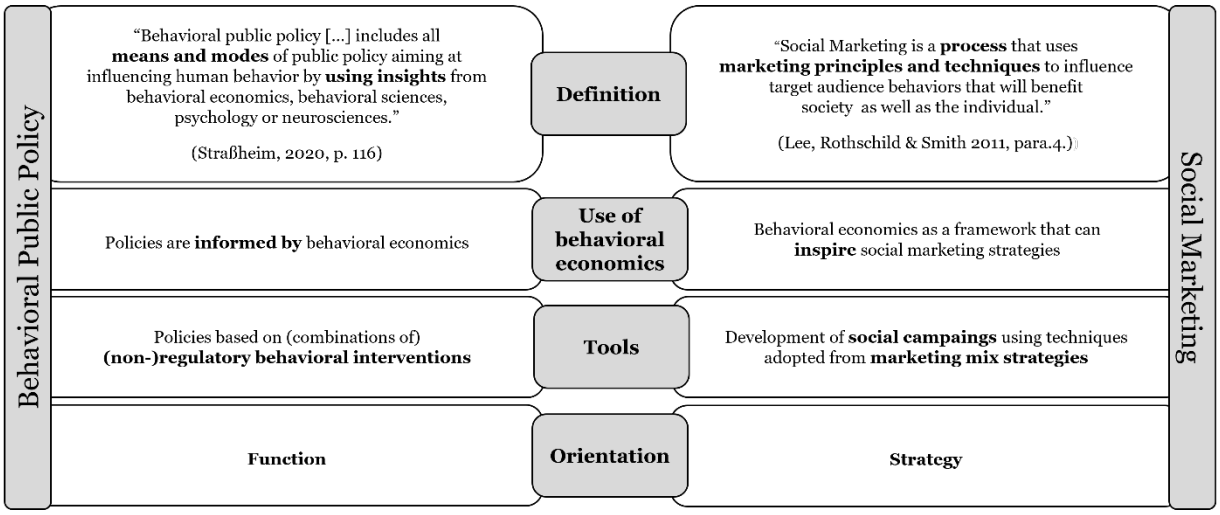


Figure 3. Comparison of behavioral public policy and social marketing

Source: Own illustration

In contrast to social marketing, which uses comprehensive marketing strategies to change behavior using behavioral economics as an inspirational framework (Lee & Kotler, 2011), behavioral public policy is informed by behavioral economics and uses insights from behavioral economics to target consumers' systematic errors in the decision-making process (Ewert et al., 2021; Oliver, 2017). Using established instruments adapted from commercial marketing mix strategies such as the 4 P's (Product, Price, Placement, Promotion), social marketing aims to develop marketing campaigns (Cheng et al., 2011; Kotler & Zaltman, 1971). In contrast, behavioral public policy relies on the idea of using a combination of (non-)regulatory behavioral interventions chosen from different concepts (e.g., Nudge, Shove, Budge) (see Chapter 2.2.2) to change consumer behavior (Oliver, 2017). However, some of those interventions can also be used as one part of a social marketing strategy (French, 2011; Velema et al., 2017). In summary, social marketing is more "strategically oriented" (Lee, Rothschild & Smith 2011, para.4.), as it explicitly makes "use of marketing skills" (Kotler & Zaltman, 1971, p. 5). Admittedly, behavioral public policy also pursues a goal-oriented strategy. However, it heavily focuses on "insights about psychological micro-mechanisms [which] increasingly inform the study, design, and implementation of public policy" (Ewert et al., 2021, p. 3), so it is more function-oriented. Despite that, both behavioral public policy and social marketing pursue the overarching goal of influencing behavior that

benefits consumers themselves and their environment (Lee et al., 2011; Oliver, 2017). To summarize, behavioral public policies, as well as social marketing strategies, can make use of behavioral interventions. The articles included in this dissertation focus on examining the effectiveness of *behavioral interventions for the common good*, which can be used either as a public policy tool or as part of a social marketing strategy.

2.2.2 Conceptualizing behavioral interventions as a tool for behavior change

Behavioral interventions can be defined as "[i]nterventions designed to change behavior ...." (Ajzen, 2006, p. 2). They may help individuals prevent or stop harmful behavior (e.g., unhealthy food choices), reinforce existing positive behaviors (e.g., healthy food choices), or establish new behaviors (e.g., shift from unhealthy to healthy food choices). In doing so, behavioral interventions may follow a libertarian and a coercive paternalistic approach (Oliver, 2017). Consequently, there is a contrast between libertarian paternalism - an approach aimed at shaping behavior in the interest of the recipient and society without restricting the recipient's freedom of choice - and coercive paternalism as an approach with restrictions on freedom of choice (Oliver, 2015). Therefore, when designing behavioral interventions, behavioral economics can be used, on the one hand, to develop non-regulatory measures and, on the other hand, to inform "how to regulate"(Oliver, 2017, p. 175), i.e., regulatory measures (Figure 4).

Rising from the field of behavioral economics, the most popular idea of behavioral interventions is the use of "nudges" (for the following paragraph, Thaler & Sunstein, 2008). Nudges are measures choice architects (e.g., policymakers, marketers) use to purposefully design choice environments to help consumers make decisions for longer, healthier, and better lives. Nudges are intended to be effective without prohibiting choice options or offering financial incentives. An example of a nudge that aims to promote healthy eating is the strategic positioning of fruit at eye level in a cafeteria, which makes healthy food immediately visible to consumers and, therefore, more easily accessible. Nudges are fairly established worldwide, especially among policymakers (e.g., "Nudge Unit" from the UK's Cabinet Office), but also in the development of social marketing campaigns (French, 2011; Rutter, 2020). As an alternative to traditional bans or regulations, nudges adopt the libertarian paternalism approach and thus rely on policies that are intended to help consumers help themselves (Thaler & Sunstein, 2008). Nudges do not intend to affect attitudes using education or persuasion programs (Oliver, 2017). Moreover, they are designed to address "psychological

mechanisms, cognitive biases, and heuristics that cause people to make decisions that often go against their own interests" (Nys & Engelen, 2017, p. 200). As such, they promise to bridge the intention-behavior gap (Bicchieri & Dimant, 2022).

The recent prominence of nudges has initiated the dawn of a variety of related ideas and concepts, such as *Self-Nudge* (Lades, 2014; Torma et al., 2018; van Epps et al., 2014), *Boost* (Grüne-Yanoff & Hertwig, 2016; Hertwig & Grüne-Yanoff, 2017) and *Nudge Plus* (Banerjee & John, 2021). Oliver (2017) also names *Budges* (Oliver, 2013b, 2015, 2017) and *Shoves* (Oliver, 2015, 2017) as frameworks in behavioral public policy. The latter ones differ from the nudge concept in following a regulatory approach (Oliver, 2017). The three main concepts - Nudges, Budges, and Shoves - are "complementary, rather than mutually exclusive approaches to behavioral public policy" (Oliver, 2017, p. 143). Figure 4 provides an overview of the nudge and related frameworks for behavioral interventions.

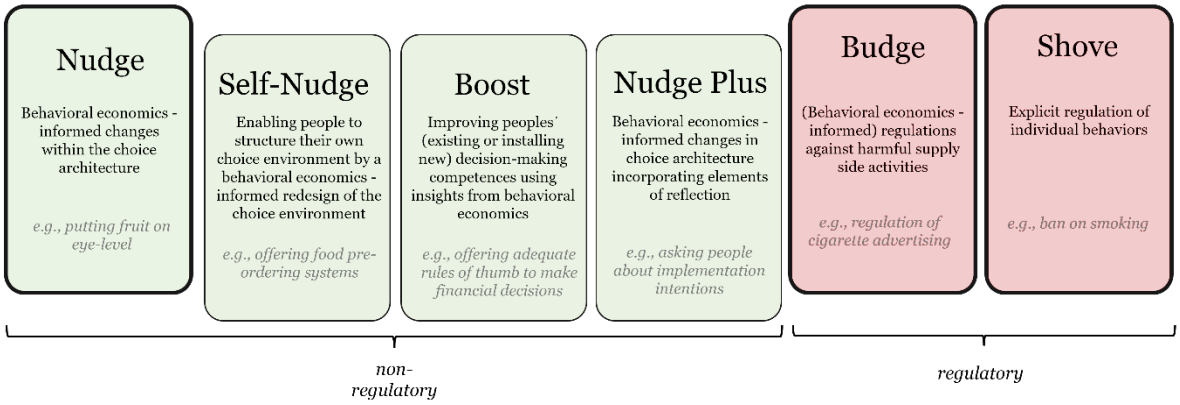


Figure 4. Concepts for behavioral interventions
Source: Own illustration

The concepts differ mainly in the intervention's degree of regulation (vs. liberty preservation) (Oliver, 2017). However, all of them are informed by behavioral economics rather than neoclassical economic theory, aiming for individual behavior change (Oliver, 2015, 2017). Therefore, not all behavioral interventions can be assigned to just one of the proposed concepts. As an example, Hertwig and Grüne-Yanoff (2017, p. 977) mention nutrition labels, which operate both as "educational nudges" and "short-term boosts." The articles included in this dissertation focus on examining the effectiveness of *non-regulatory behavioral interventions*. The general term “behavioral interventions” will be used predominantly in the following.

2.3 Application contexts and application areas of behavioral interventions

In order to conceptualize the use of behavioral interventions in different application contexts and application areas, an *Application Context-Application Area (ACAA) matrix* is used to embed the types of behavioral interventions relevant to this thesis. The ACAA matrix will be introduced in the following subsections. To provide a basis for assessing the effectiveness of selected behavioral interventions in different application areas and contexts (RQ 1), the following subchapters deal with the components of the ACAA matrix: application context, application area, and types of behavioral interventions.

2.3.1 Behavioral interventions in different application contexts

With the help of behavioral interventions, public policymakers and social marketers address critical challenges in various decision-making contexts. As the title of the original work by Thaler and Sunstein (2008), "Nudge - Improving Decisions about Health, Wealth and Happiness," suggests, the authors propose the use of choice architecture tools, for example, in the context of promoting *health* and improving decisions in the realm of *finance*. However, behavioral interventions are often used in *energy and environmental* or *privacy* contexts (Hummel & Maedche, 2019). In addition, behavioral interventions are used for public policy in the context of *education* (Graham et al., 2017). Behavioral intervention development is essentially linked to a context-specific problem. In the context of financial decisions, interventions are used, for example, to achieve an increase in charitable giving (Bartke et al., 2017) or tax compliance (Cyan et al., 2017); in the privacy context they are designed to improve privacy protection (Baek et al., 2014). Behavioral interventions in education, for example, focus on promoting student engagement (Graham et al., 2017) or improving academic outcomes (Castleman & Page, 2015). Interventions in the health context target, among other things, the promotion of healthy food choices or increased physical activity to combat obesity (e.g., Adam & Jensen, 2016; Forberger et al., 2019; Laiou et al., 2021). Behavioral interventions in the area of energy and environment address, for example, household energy conservation (e.g., Abrahamse et al., 2005) but also food waste reduction (e.g., Kallbekken & Sælen, 2013) or pro-environmental food choices (e.g., Piester et al., 2020). Figure 5 provides an overview of application contexts of behavioral interventions and examples of problems they target.

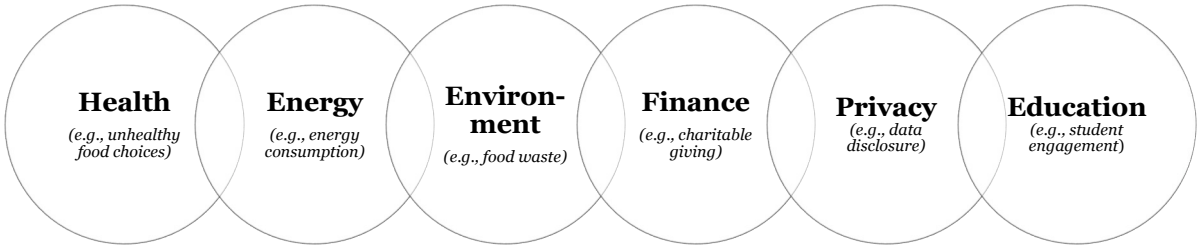


Figure 5. Application contexts of behavioral interventions and examples of targeted issues

Source: Own illustration

The popularity of behavioral interventions, mainly as a public policy tool, is also reflected in the number of empirical studies in recent years (Victor et al., 2023). Since the introduction of the nudge concept in 2008, there has been a steady increase until 2019, followed by a slight decline in publications related to behavioral interventions for use in public policy in the following two years (possibly also due to the COVID-19 pandemic) (Victor et al., 2023).

In accordance with most other studies investigating behavioral interventions, this thesis will focus on promoting pro-environmental choices (which will be subsumed under the term *sustainability* [2]) in the context of energy and the environment and fostering healthier lifestyles in the context of *health* [3] (Hummel & Maedche, 2019).

2.3.2 From the analog world to virtual realities: Behavioral interventions in different application areas

Behavioral interventions are used in different application contexts and different *application areas*. In the following, the term application area refers to the "world" (analog, digital, virtual) in which a behavioral intervention is applied. Behavior might change within this area (e.g., behavioral intervention in the analog world affects consumer behavior in the analog world) or across areas (e.g., behavioral intervention in the digital world affects consumer behavior in the analog world). Behavioral interventions in the *analog* world are usually aimed at influencing real-world behavior, such as everyday decision-making situations, for example, at the point of sale (e.g., Brečić et al., 2021; Nikolova & Inman, 2015). One example is labeling food packages in

[2] In this thesis: fostering pro-environmental behavior in terms of energy consumption and reduction of animal-based food products.

[3] In this thesis: fostering healthier diets, improving physical activity, prevention of infections, and prevention of licensing effects.

supermarkets, which is intended to guide consumers in their decision-making at the point of sale (Ducrot et al., 2015).

Because ever more decisions today are made in a digitally-infused environment (e.g., computers, smartphones, smartwatches) and thus on different types of user interfaces (e.g., ERP screens, web-based forms), the use of behavioral interventions is expanding to include another application area – the *digital* world (Weinmann et al., 2016). In this regard, Weinmann et al. (2016) introduced the concept of *digital nudging*, which describes "the use of user-interface design elements to guide people's behavior in digital choice environments." (p. 433). In this context, digital choice environments describe "user interfaces [...] that require people to make judgments or decisions" (p. 433). While some types of behavioral interventions can be transferred from analog to digital environments, digital user interfaces offer a new form of choice environment and thus introduce a new perspective on choice architecture and decision-making (Weinmann et al., 2016). Consequently, not all types of behavioral interventions can be seamlessly transferred to the digital world (Lembcke et al., 2019). However, the evolution of digital interfaces presents new opportunities for implementing behavioral interventions that were previously inconceivable in analog contexts, such as user-centricity of behavioral interventions or time- and space independencies (Bammert et al., 2020; Lembcke et al., 2019; Michels et al., 2021). Behavioral interventions can thus be personalized or may use real-time feedback (Karlin et al., 2015; Mirsch et al., 2017). However, interventions on digital user interfaces can influence decisions in the digital world but also have effects across areas (Weinmann et al., 2016). For example, information on their own physical activity shown to consumers on a smartwatch can motivate them to change their behavior (e.g., higher physical activity) in the analog world (Lembcke et al., 2019).

With the predicted rise of the metaverse, the digital world is now being augmented by a *virtual* world in which consumers can enjoy more immersive experiences (Dwivedi et al., 2022). Virtual worlds offer new opportunities for communication, whereby the shift from information-based to experience-based communication is particularly relevant (Plechatá et al., 2022). Behavioral interventions benefit consumers by allowing them to visualize worlds that were previously difficult to imagine (Fauville et al., 2020). Similar to the digital world, experiences in the virtual world can alter behavior in the virtual world and spill over to the analog world (Foehr & Germelmann, 2022).

2.3.3 Types of behavioral interventions: Problem-based selection and unintended effects

When selecting behavioral interventions, both the underlying problem and the desired behavior should be considered (Schneider et al., 2018). To this end, the occurring biases in decision-making must first be identified in order to then choose appropriate behavioral interventions out of a wide range of different types of interventions that specifically address them (Mirsch et al., 2017; Schneider et al., 2018). Numerous approaches in the literature structure different types of behavioral interventions (e.g., Baldwin, 2014; Blumenthal-Barby & Burroughs, 2012; Dianoux et al., 2019; Dolan et al., 2012; Hansen & Jespersen, 2013). Sunstein (2019, p. 128) describes the following ten behavioral interventions (Table 1) as "the most important for purposes of policy."

Table 1. Types of behavioral interventions

Source: Own illustration, adapted from Hummel & Maedche (2019) & Sunstein (2019)

Type of Intervention	Description	Example	Interventions examined within this thesis
Default rules	Introduction of standard specifications	Printing on both sides of the paper as standard specification	/
Simplification	Simplification of complex or abstract processes	Simplification of a complex form	*Implementing visualizations of abstract scenarios*
Use of social norms	Highlighting behaviors that our peers "normally" exhibit	"Most people plan to vote."	*Use of social norms (e.g., dietary behavior of others) or socially comparative feedback (e.g., comparing one's energy consumption with others)*
Increases in ease and convenience	Simplified access to preferred alternatives	Placement of fruit at eye level	/
Disclosure/ Salience	Disclosure/ Salience of information	Disclosing costs of energy use	*Making the appropriate minimum distance to other people in public spaces more salient*
Labeling, Warnings, Graphics	Warnings, graphics, or information signs	Warnings on cigarettes	*Labeling the nutritional quality of food products*
Precommitment	Commitment strategies	Enrollment in a smoking cessation program	/
Reminders	Reminders	Mails reminding about unpaid invoices	/
Implementation intentions	Activation of behavioral intentions	"Do you plan to vote?"	/
Feedback	Clarification of the consequences of past behavior	Feedback on past energy consumption	*Feedback on goal progress*

Table 1 shows a selection of behavioral interventions that aim to solve the problem of systematic errors in decision-making through changes in choice architecture. The articles presented in this thesis examine the effectiveness of 1) *salience of information*, 2) *labeling*, 3) *simplification (using visualization)*, 4) *feedback*, and 5) the *use of social norms*, as these types of behavioral interventions previously proved to be effective tools in several studies in the health and sustainability context addressing a specific problem in decision making (for a meta-analysis see, e.g., Hummel & Maedche, 2019). However, past research has also shown that the use of social norms and the provision of feedback do not always bring about the intended behavior. Instead, they can introduce *unintended effects* in consumer decision-making (e.g., Buchanan et al., 2015; Schultz et al., 2007). Therefore, two of the research articles in this thesis deal with unintended effects (e.g., the licensing effect) in depth. To this end, the following description of the selected types also refers to possible unintended effects of feedback and social norms.

1. *Salience of information*

To counter biases such as absent-mindedness or the present bias, particularly in situations of information overload, the salience of information can be used as a tool for behavior change. According to salience theory, consumers focus their attention on aspects and information in their environment that stand out (i.e., which are salient) in the moment of decision-making (Bordalo et al., 2013). Hence, increasing salience as a behavioral intervention aims to draw attention to specific information previously neglected or overlooked by consumers (Hagman et al., 2015; Sunstein, 2014). Compared to disclosing new information, salience serves as a reminder within a specific choice architecture, which emphasizes already-known information (Hansen, 2016). To cope with information overload, consumers focus on conspicuous stimuli that are easy to decode (Dolan et al., 2012). In this way, they, for example, subconsciously seek out salient signs in their environment, such as human-like shapes (e.g., smileys or footprints) that may guide decision-making (Guthrie, 1995). Using such anthropomorphic signs, for instance, to make the appropriate minimum distance to other people in public spaces more salient (see RA 2) [4] is just one of many examples of the use of salience as a behavioral intervention tool. In other fashion, consumers also react to information

[4] In the following, reference is made to the corresponding research article (RA) included in this thesis. An overview of the RAs is provided in chapter 2.4.

that is made salient by signal colors (Bauer & Reisch, 2019).

In this respect, previous research on food product advertising showed, for example, that using different color dimensions on the food packages can have a decisive effect on key variables in the decision-making process (Bezaz & Kacha, 2021). From a public policy perspective, the use of red and green signal colors known from the traffic context can grab a customer's attention and further trigger a "red-stop, green-go" heuristic (Chen et al., 2017; Liu et al., 2014). Based on this idea, signal colors aid decision-making in a closely related behavioral intervention: labeling.

2. *Labeling*

Labels as a behavioral intervention in behavioral public policy or social marketing can serve as reminders for a healthier diet by making information salient (Bauer & Reisch, 2019). However, they can also be used to provide new information or warnings that can influence the consumer's opinion about the decision and, thus, their behavior (Bauer & Reisch, 2019; Song et al., 2021). Making information salient or providing new information relevant to the decision labels can thus counteract biases such as absent-mindedness and present bias. In the context of sustainability, eco-labels on food products can be used to foster pro-environmental food choices (Potter et al., 2021). In the health context, labels mainly appear on food products either for the prevention of unhealthy consumption or the promotion of healthy consumption (for the following paragraph, Zlatevska et al., 2023). Three different label types can be distinguished: first, health claims (e.g., fat-free slogans) or logos that are used as labels to promote healthy food. Second, warning labels (e.g., high in sugar alerts), in contrast, are used to prevent the consumption of unhealthy foods. Third, some labels simultaneously serve the promotion of healthy foods and the prevention of unhealthy foods. These include quantitative labels (e.g., amount of calories per cup) or multicomponent labels, which provide information on the ingredients of the respective food products to indicate their nutritional quality. In recent years, grading systems have become particularly relevant in various European countries, especially Germany (BMEL, 2023). They provide a summarized evaluation of products' nutritional quality and are typically based on a rating scheme that classifies products according to their nutritional quality (Zlatevska et al., 2023). Grading systems often involve signal colors designed to help consumers quickly identify which foods are of high or low nutritional quality (Dubois et al., 2021). Most prominently, traffic-light labels using signal colors such as red and

green are employed to trigger the previously described "red-stop, green-go" heuristic (Chen et al., 2017; Liu et al., 2014). In this way, labeling the nutritional quality of food products using traffic-light colors can strategically emphasize consumers' long-term health goals in the goal conflict, which is often biased towards immediate pleasure goals (i.e., present bias), especially regarding food choices (Papies & Hamstra, 2010). One of the most widely used traffic-light labels in the EU is the so-called *Nutri-Score*, which represents a 5-level color and letter scale (Dubois et al., 2021). In the following, the Nutri-Score will be classified as a typical label intervention due to the provision of information via an on-product label (see RA 1). Nevertheless, this example also shows that the Nutri-Score could also serve as an intervention to make information *salient* or could also be used as a tool for *simplifying* complex decisions. Simplification can also be considered a separate type of behavioral intervention.

3. *Simplification (using visualization)*

Many situations include complex decisions in which consumers have to decide on options whose consequences will only manifest in the distant future (temporal distance) or at distant locations (spatial distance) and are thus difficult to comprehend (Fauville et al., 2020). Within the context of pro-environmental decision-making, this problem can be addressed by simplifying the understanding of the long-term consequences of current behavior, for example, by using visualizations of climate change effects (Nim et al., 2016). Visualizations of future scenarios have already been studied as a behavioral intervention to affect consumer behavior in different contexts (e.g., Fauville et al., 2021; Markowitz et al., 2018; Petersen et al., 2020). Here, digital technologies offer new opportunities as they provide "increasing access to information, knowledge, and experiences to individuals around the world" (Fauville et al., 2020, p. 92) in order to help "[m]aking the invisible visible." (Fauville et al., 2020, p. 92) Implementing visualizations and making use of virtual reality (VR) (see RA 6) offers a unique opportunity to illustrate abstract scenarios, enabling consumers, for example, to travel to different virtual worlds and previous or future times (Breves & Schramm, 2021; Fauville et al., 2020; Markowitz & Bailenson, 2021). By using immersive virtual reality, consumers can, for example, be taught about the consequences of actual behavior on climate change (Markowitz et al., 2018). Besides that, it can also affect environmental attitudes, such as environmental concern and self- or response-efficacy (Ahn et al., 2015; Fauville et al., 2020; Meijers et al., 2022), resulting in pro-environmental behavior.

4. Feedback (and the problem of "licensing effects")

Yet another type of behavioral intervention prominently discussed in the literature is the provision of feedback. Along with goal-setting theory, which states that behavior is significantly influenced by overarching goals and especially by feedback on these goals, goal feedback can provide a sense of progress, reward, and recognition, thereby increasing motivation for consumers to achieve these goals (Latham & Locke, 1979; Locke et al., 1981). Feedback is particularly effective in drawing the individual's attention to discrepancies between actual behavior and higher-level goals that are important to them (Karlin et al., 2015). Feedback thus provides a reference point with which consumers compare themselves and consequently try to adjust their behavior (Karlin et al., 2015). Accordingly, using feedback as a behavioral intervention specifically addresses the anchoring and adjustment heuristic, according to which consumers take reference points as a decision-making benchmark (Dhami & Sunstein, 2022; Epley & Gilovich, 2006). An auspicious way of providing feedback is the use of digital tools, as they allow personalized feedback in real time based on personal reference values (Karlin et al., 2015; Weinmann et al., 2016). Feedback is often used within the context of sustainability, for example, in order to promote energy conservation (for a meta-analysis, see Karlin et al., 2015). A well-known application for feedback in the health context is the feedback on goal progress on a smartwatch (see RA 3), for instance, through real-time notifications that are intended to motivate consumers to be more physically active in everyday life (Weinmann et al., 2016).

However, previous studies indicate that providing feedback can have ambiguous effects (e.g., Fishbach & Dhar, 2005; Schultz et al., 2007). Although goal gradient theory posits that individuals' motivation increases as they progress toward a goal (Hull, 1932), research has shown that feedback on positive goal progress or even goal attainment may result in compensatory strategies such as licensing effects (often also known as moral belief effect, moral licensing, and self-licensing) (Khan & Dhar, 2006; Merritt et al., 2010; Monin & Miller, 2001; Witt Huberts et al., 2012). For this effect, an initial decision for a good deed strengthens the consumer's self-concept and thus justifies immoral behavior, leading to unintended behavior (Kronick et al., 2011). The licensing effect has been extensively studied in the context of sustainability (Meijers et al., 2019) and health. Regarding the latter, among others, Finkelstein and Fishbach (2010) demonstrated that selecting food items considered healthful leads consumers to

perceive progress in their health objectives, permitting them to indulge in subsequent decisions. However, such balancing strategies are applied to food choices and could also occur within physical activities. After physical activity, consumers may tend to treat themselves with rewards within the same context, for example, relaxation after exercising or even with cross-contextual rewards (i.e., cross-domain licensing) such as unhealthy foods (Fishbach & Dhar, 2005; Miller & Effron, 2010).

To conclude, feedback on goal progress – besides its positive effects on consumer behavior – possibly leads to systematic errors. As feedback typically provides a reference point from which consumers try to adjust their behavior, personal goals (Latham & Locke, 1979), past behaviors, and social norms can also be used as reference points (Lopes et al., 2019). Social norms can also be considered a separate behavioral intervention type, which will be explained in more detail below.

5. *Social norms (and the problem of "downward social comparisons")*

The last type of behavioral intervention examined in this dissertation deals with using social norms to guide behavior. In this sense, Blumenthal-Barby & Burroughs (2012, p. 5) stated: "We are social creatures, and as a result, we rely on other people for our behavioral and decisional cues." Consumers use other people's behavior as a model for their own behavior and often feel the need to be above average (Loewenstein et al., 2014; Schultz et al., 2008). As a result, social norms can function as heuristics and, thus, guide behavior if they are made salient to the decision-maker (Cialdini et al., 1991; Kallgren et al., 2000). Consumers often fall back on social norms, especially when they need more information in the decision-making process (Kitano et al., 2022). Thereby, reference points provide information regarding what others do or think we should do (Cialdini et al., 1991). Furthermore, providing feedback on social norms aims to help individuals reflect on their behavior and motivate them to adopt the behavior of others (e.g., more pro-environmental behavior) (Lopes et al., 2019; Zimmermann et al., 2021). The use of social norms has been widely studied in the past, particularly in the sustainability context (e.g., Allcott, 2011; Allcott & Rogers, 2014; Borg et al., 2020; Goldstein et al., 2008; Loock et al., 2011; Schultz et al., 2007) and proofed to affect consumer behavior (for a meta-analysis see Melnyk et al., 2022). Behavioral interventions using social norms often not only aim to make social norms salient (e.g., dietary behavior of others) (see RA 4) but also use them in the form of socially comparative feedback (e.g., comparing one's energy consumption with others)

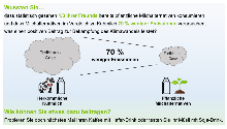
(see RA 5) (Abrahamse und Steg 2013). While socially comparative feedback “consists of providing people with feedback about their performance, compared with the performance of other people" (Abrahamse & Steg, 2013, p. 1775), making a social norm salient function “without necessarily directly comparing it to the behavior of the feedback recipient” (Abrahamse & Steg, 2013, p. 1775). However, the effectiveness of social norms may depend on how the social norm is constructed. For example, based on construal-level theory, the mode of action of a social norm could be influenced, in particular, by the social psychological distance to the reference point (Trope & Liberman, 2010). Literature also shows that the type of social comparison can play an important role in behavioral change (Abrahamse & Steg, 2013).

Several researchers observed that the type of socially comparative feedback presented could, however, also be problematic (Abrahamse & Steg, 2013; Buchanan et al., 2015; Croson & Shang, 2008; Heath et al., 1999; Schultz et al., 2007). Because reference points act “as a magnet for behavior for individuals both above and below the average" (Schultz et al., 2007, p. 430), both individuals above and below are pushed toward the social norm. As a result, consumers who already behave better than the average (downward social comparison) may give themselves permission to license according to the social norm and, as a result, behave worse than before (Heath et al., 1999). Consequently, social norms - predominantly downward social comparisons - may lead to systematic errors.

Summarizing this overview, it should be noted that in many cases, it is not always straightforward to assign behavioral interventions clearly to one particular type of intervention. For example, the Nutri-Score can be seen as a labeling-, salience- or simplification-intervention. Further, social norms are often used in the form of socially comparative feedback and, thus, represent an intervention that pursues the goal of disclosing or making information salient. However, within this thesis, the interventions examined were assigned to a single, predominant type of intervention based on the problem they address. The selection of the type of intervention followed a problem-based approach in which the problem and the bias in the decision process were identified first before a behavioral intervention was selected. Table 2 shows an overview of the problem-driven selection of interventions tested in this thesis.

Table 2. Problem-driven selection of behavioral interventions investigated in this thesis

Source: Own illustration

Problem	Possible solution	Selected type of behavioral intervention	Tool investigated in this thesis [5]
Consumers choose unhealthy food in a self-service canteen.	Making healthy options more salient by using traffic-light colors.	**Labeling** (RA 1)	Traffic-light label *(Nutri-Score)* 
Consumers forget to keep or cannot estimate the appropriate minimum distance in public spaces.	Making the information about the appropriate distance to other people salient using footprints as position markers.	**Salience** (RA 2)	Anthropomorphic sign *(Footprints)* 
Consumers are not aware of the effects of their dietary habits on the environment.	Informing consumers about the consequences of animal food items using social norms within an animated poster.	**Social Norm** (RA 4)	Information using social comparison *(Animation)* 
Consumers are not aware of the effects of their dietary habits on the environment.	Simplifying the understanding of the consequences of consuming animal-based food using visualizations in VR.	**Simplification** (RA 6)	Virtual reality *(Visualization)* 

[5] For full-size pictures of the tools investigated in this doctoral thesis, see Appendix A or the corresponding research article.

The aim of this thesis is, on the one hand, to investigate how effective different types of behavioral interventions are in different application contexts and different application areas. On the other hand, this thesis explores and explains the unintended, negative effects that the use of behavioral interventions could induce. Table 3 illustrates the interventions examined in this thesis, which focus on the occurrence of unintended effects.

Table 3. Unintended effects of behavioral interventions investigated in this thesis
Source: Own illustration

Hypothesized problem	**Aim of investigation**	**Selected type of behavioral intervention**	**Tool investigated in this thesis**
Consumers license themselves when they receive feedback on their goal progress.	Uncovering unintended, negative effects of perceived goal progress signaled by a smartwatch.	**Feedback** (RA 3)	Feedback on goal progress *(Smartwatch)* 
Consumers license themselves when they receive downward socially comparative feedback.	Uncovering unintended, negative effects of downward social comparison within a smart home app.	**Social Norm** (RA 5)	Socially comparative feedback *(Smart Home App)* 

2.4 Integrating behavioral interventions into the Application Context-Application Area matrix

2.4.1 Conceptual framework of the thesis

This second chapter concludes by embedding the types of behavioral interventions examined in this thesis in the conceptual framework of this doctoral thesis – the ACAA matrix (Figure 6).

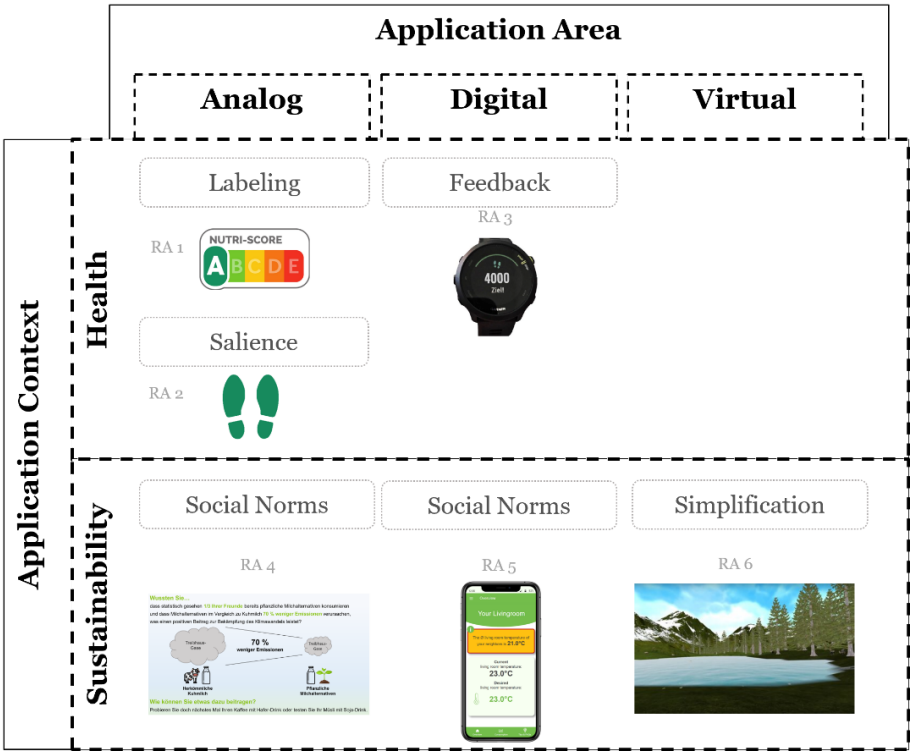


Figure 6. Integration of behavioral intervention types used in this thesis into the Application Context - Application Area matrix

Source: Own illustration

This thesis focuses on behavioral interventions in the health and sustainability contexts. It must be noted that there are several examples showing that the contexts of health and sustainability are often closely linked (e.g., food choices; see e.g., Sleboda et al., 2024). However, the behavioral interventions investigated in this thesis are assigned to either one of those application contexts based on the problem addressed. The classification of the articles to application areas is based on the choice architecture in which the behavioral intervention is applied, not on the area impacted by the behavioral intervention. For example, although the signals of a smartwatch - as previously described - affect behavior in the analog world, the digital user interface still forms the

changed choice architecture, meaning this intervention will be assigned to the digital (not analog) application area.

As part of this thesis, three behavioral interventions were investigated in the analog world: In the health context, the effectiveness of the Nutri-Score in a self-service canteen to promote healthy eating (RA 1) as well as the effectiveness of footprints in a supermarket as a guideline for keeping the required minimum distance to other people during the COVID-19 pandemic were examined (RA 2). In the context of sustainability, the effectiveness of social norms (used within an animated poster) in reducing cow´s milk consumption was investigated (RA 4). The examination of behavioral interventions in the digital world focused on uncovering unintended effects. In the health context, a digital nudge on a smartwatch in the form of feedback on goal progress has been studied to investigate the occurrence of (cross-contextual) licensing effects (RA 3). In the context of sustainability, downward social comparisons and their unintended effects were examined (RA 5). Within the virtual world and in the context of pro-environmental food choices, the effectiveness of visualizing the consequences of increased meat consumption using VR tools was investigated (RA 6).

2.4.2 Overview of research articles

All articles included in this thesis can be regarded as independent research projects that do not build on one another. However, all articles follow a common scheme: they evaluate the effectiveness of behavioral interventions as an approach to overcome the intention-behavior gap, with some studies dealing with the underlying mechanisms of action. In doing so, they all contribute to answering the overarching research questions RQ 1 and RQ 2. Table 4 provides an overview of the articles presented in this thesis and their underlying research questions, and their current status in the publication process.

The first article (RA 1) deals with the question of how a traffic-light label (i.e., the Nutri-Score) affects consumers' decision-making process and, thus, the choice of a (lunch) menu in a self-service canteen. Building on three studies, both qualitative and quantitative, conducted under laboratory conditions and in the field, the effect of the Nutri-Score label on actual behavior, the underlying mechanisms, and the role of food choice motives are investigated.

The second article (RA 2) researches a social distancing intervention during the COVID-19 pandemic. In a field experiment, footprints (in combination with signposts) were implemented in a German supermarket to make information for maintaining distance salient. It was tested whether they help consumers at the point of sale to maintain the specified minimum distance for the benefit of health, both in the short term and in the long term.

The third article (RA 3) focuses on uncovering the unintended effects of feedback on goal progress. In a field experiment, the influence of feedback on goal progress displayed on a smartwatch on users' physical activity and food choices was investigated. In particular, it was investigated whether feedback on goal progress triggers unintended behaviors.

The fourth article (RA 4) looks into the effect of a combination of social norms and sustainability information on the consumption of milk drink alternatives, such as oat milk. This study focused on the behavioral intervention's short- and long-term effects. Moreover, the role of the social dimension of psychological distance was examined.

The fifth article (RA 5) examines social norms as a digital behavioral intervention within a smart home app. It investigates under what circumstances digital social norm nudges lead to adverse effects in promoting pro-environmental user behavior. The focus of this online experiment is thus on the detection of unintended effects.

Finally, the sixth article (RA 6) examines the effectiveness of simplification using VR in environmental communication. This study compared the effects of information-based and experience-based VR communication [6]. The effects of the behavioral intervention were examined in terms of behavior in VR (1), behavioral intentions (2), objective behavior in a real-life buffet (3), and long-term real-world behavior (4). The focus here was, therefore, not only on the short-term but also on the long-term effects of the behavioral intervention.

[6] In Article 6, *renaming of dishes* was also examined as an additional behavioral intervention. However, the article's main focus lies in investigating the VR intervention. The analyses showed that the effects occurring are exclusively attributable to the VR intervention, which is why this dissertation focuses on VR as a behavioral intervention tool but not on the renaming of dishes.

Table 4. Overview of research articles included in this thesis
Source: Own illustration

RA	Title	Authors	Research Question(s)	Current Status
1	**Actions Speak Louder Than Labels:** **Empirical studies on (lacking) effects and underlying mechanisms of traffic-light-labels on food choice in self-service canteens**	**Merkl, Lisa-Marie;** Diekmann, Larissa; Germelmann, Claas Christian;	To what extent does labeling the nutritional quality of prepared dishes using a traffic-light label (here, the Nutri-Score) affect consumers' decision-making process and, thus, choice of a (lunch) menu in a self-service canteen?	**<u>In revision/ Planned resubmission</u>** *Previous versions were presented at the European Marketing Association Conference (EMAC) 2022 and the Academy of Marketing Science (AMS) Annual Conference 2023*
2	**Nudging Physical Distance During COVID-19: Short-Term and Long-Term Wear-Out Effects of Nudges in A Retail Setting**	**Harnischmacher, Jannike;** Merkl, Lisa-Marie; Germelmann, Claas Christian;	1) Do salience nudges (lines on the floor vs. footprints) achieve the desired effect of aiding customers to maintain a distance of 1.5 meters from one another? 2) Do these nudges generate long-term effects?	**<u>Published</u>** **Proceedings of the 2023 AMS Annual Conference** *A previous version was presented at the French-Austrian-German Workshop on Consumer Behavior 2022*
3	**Unlocking the Consequences of Perceived Goal Progress: Does Closing the Activity Ring Lead to Adverse Effects in Smartwatch Usage? - A Field Study**	**Merkl, Lisa-Marie;** Germelmann, Claas Christian; Henze, Moritz; Kuhn, Johanna;	To what extent does the Feedback on goal progress on a smartwatch influence users' physical activity and food choices?	**<u>Accepted for presentation</u>** **Academy of Marketing Science (AMS) World Marketing Congress 2024**

RA	Title	Authors	Research Question(s)	Current Status
4	**No milk today? Shifting consumer behavior toward milk drink alternatives to reduce greenhouse gases**	**Brand, Benedikt;** Specht, Marie; Merkl, Lisa-Marie;	1) To what extent can sustainability information combined with social norms increase the consumption of Milk Drink Alternatives (MDAs)? 2) To what extent does the social dimension of psychological distance affect the frequency of consuming MDAs? 3) To what extent does sustainability information combined with social norms have a long-term effect on the consumption of MDAs?	**In revision/ Planned for resubmission**
5	**Digital Help for those who are already covered - An experimental study on the effects of digital Nudging to promote sustainable behavior**	**Merkl, Lisa-Marie;** Wagon, Felix; Graf-Drasch, Valerie; Germelmann, Claas Christian;	When do digital social norm nudges lead to adverse effects in promoting sustainable user behavior?	**In revision/ Planned for resubmission**
6	**Shifting from information- to experience-based climate change communication increases pro-environmental behavior via efficacy beliefs**	**Adéla Plechatá;** Hielkema, Marijke; Merkl, Lisa-Marie; Makransky, Guido; Bom Frøst, Michael;	How effective is the use of virtual reality (VR) as a means of environmental communication, compared to information-based and experience-based VR communication in terms of behavior in VR (1), behavioral intentions (2), objective behavior in a real-life buffet (3), and long-term real-world behavior (4)?	**Published** **Journal of Environmental Communication** *A previous version was presented at the International Conference on Environmental Psychology 2023*

3 Testing behavioral interventions: Gaining behavioral insights from transformative consumer research

Various methods are used in consumer research to gain behavioral insights based on behavioral economics (Camerer et al., 2004). Consumer research attempts to answer the "Why?" and "How?" questions of consumer behavior (Kroeber-Riel & Groeppel-Klein, 2019, p. 4). Thereby, behavioral economics and consumer research are based on the same psychological theories (Kroeber-Riel & Groeppel-Klein, 2019). However, while companies can use these behavioral insights from consumer research to build influential marketing strategies, governments primarily use them to improve public policies (Cartwright, 2014; Chriss, 2015). One particular approach to consumer research that has become increasingly established in recent years, especially in the Association for Consumer Research community, is *transformative consumer research* (TCR). TCR describes "investigations that are framed by a fundamental problem or opportunity, and that strive to respect, uphold, and improve life in relation to the myriad conditions, demands, potentialities, and effects of consumption." (Mick, 2006, p. 2) Hence, TCR focuses on “substantive problems or opportunities of well-being rather than theory contributions per se” (Mick et al., 2012, p. 12), meaning that researchers use theories complementary in order to solve prevalent problems. Nonetheless, TCR aims to gain substantial and theoretical insights, which can be generated through quantitative testing of hypotheses as well as qualitative research methods (Mick et al., 2012).

3.1 Quantitative research methods

The articles included in this doctoral thesis build on TCR from a behavioral economics perspective. Moreover, they aim to gain behavioral insights for the common good rather than profit-making using quantitative, qualitative, or mixed research methods. The choice and implementation of research methods are guided by a philosophical framework and, therefore, an overarching research paradigm (Bowling, 2023; Durdella, 2019). The articles included in this thesis mainly follow a positivist-(post-positivist) research paradigm [7] representing an explanatory approach that aims to formulate generalizable statements and test them empirically (Kroeber-Riel & Groeppel-Klein, 2019). Assuming the existence of an objective reality, within this paradigm,

[7] Discussion clarifying the adoption of multiple research paradigms in chapter 3.2.

mainly experimental designs are used as a research strategy to explain consumer behavior, make predictions, and derive recommendations on how to change behavior (Durdella, 2019; Kroeber-Riel & Groeppel-Klein, 2019). This dissertation mainly includes studies that expand on experimental research designs (RA 1, 2, 3, 4, 5, 6).

An experimental research design is typically chosen to test precisely formulated causal hypotheses to uncover cause-and-effect relationships (Böhler et al., 2022). To test the relationship between at least two variables, the experimenter manipulates at least one variable (independent variable) that is hypothesized to have an effect while the dependent variable(s), which are assumed to be affected by the independent variable(s), are measured by the experimenter (Spilski et al., 2018). As described above, behavioral interventions are typically based on changes in choice architecture. As part of experiments, these interventions represent the manipulated variable, i.e., the experimental stimulus. A stimulus should be "well made and realistic, but at the same time as simple as possible" (Geuens & Pelsmacker, 2017, p. 85). Within the articles presented in this thesis, attention was paid to the simplicity of the stimuli and their realistic use as a behavioral intervention tool (e.g., Nutri-Score (RA 1) and Footprints (RA 2)). Furthermore, pre-experimental tests were conducted to ensure that the "independent variables alter what they intend to alter." (Cook & Campbell, 1979, p. 60)

Regarding measuring variables, researchers must ensure that the selected measures are characterized by high validity and reliability (Churchill, 1979). To do so, researchers can draw on established and validated scales (e.g., Boyle et al., 2015; Bruner, 2019). Hereby, in addition to the use of single-item scales, multi-item scales have become increasingly common practice (Churchill, 1979). To measure the effect of the independent variable on the dependent variable, the experimenter additionally controls confounding variables (e.g., gender, age, environmental attitudes) that may also affect the dependent variable (Böhler et al., 2022). Besides confounding variables, moderators are used to check if the causal effect of those variables is influenced by "a third variable or a set of variables" (Hayes, 2022, p. 8). Furthermore, mediators are often measured as intervening variables to better understand the psychological processes between the independent and dependent variables (Rucker et al., 2011). The studies included in this thesis are mainly based on established scales and include a check for confounding variables whenever possible. Some RAs (e.g., RA 1, 4, 5, 6) also investigated the effects of moderators and mediators.

To test the derived hypotheses experimentally, researchers generally choose between laboratory and field experiments (Iacobucci & Churchill, 2018). Laboratory experiments typically take place in an artificially constructed environment (Böhler et al., 2022). While they offer the advantage of controlling external confounding variables to a great extent, they also carry the disadvantage of unrealistic conditions and the problem of subjects being aware of the experimental situation and, as a result, possibly not exhibiting "real" behavior (Homburg, 2020). Laboratory experiments can be conducted physically in a survey room or digitally as online experiments (Böhler et al., 2022). On the other hand, field experiments are carried out in natural environments and thus offer the benefit of being more realistic but are also characterized by sometimes uncontrollable confounding variables (Homburg, 2020). While some authors argue that - to be considered a field experiment - participants must not be aware that they are involved in the experiment, Charness et al. (2013) argue that the participants' awareness of being involved in the experiment does not necessarily preclude it from being considered a field experiment. Concerning the evaluation of the quality criteria of experiments, laboratory experiments are, therefore, characterized by high internal validity (e.g., in terms of controlling for confounding factors) and low external validity (e.g., in terms of generalizability), while field experiments are characterized by low internal validity and high external validity (Homburg, 2020). Several authors recommend combining different research designs to answer a research question to counter the problem of low external validity in laboratory experiments or low internal validity in a field experiment (Geuens & Pelsmacker, 2017; van Kleef & van Trijp, 2018). In addition to testing the effectiveness of a stimulus within an online study, for example, a follow-up study in the form of a field experiment could be conducted under realistic conditions (see, for example, RA 1 and 6) (Geuens & Pelsmacker, 2017; van Kleef & van Trijp, 2018). The RAs included in this dissertation use experiments under laboratory conditions, on the one hand, in the form of online experiments (RA 1, 4, 5) and, on the other hand, in a test laboratory (e.g., "iBuffet" of RA 6). Last, field experiments were conducted in real-choice environments (RA 1, 2, 3, 6).

The selection of the sample should be subject to random sampling (Geuens & Pelsmacker, 2017). It should be noted that in some studies - especially field studies - random selection of the sample or random assignment to the treatment or control group, as well as total control over confounding variables, is impossible. Literature

labels experiments, conducted under such conditions, as quasi-experiments [8] (Cook & Campbell, 1979; Iacobucci & Churchill, 2018). Therefore, researchers must consider these factors when analyzing and interpreting the data (Böhler et al., 2022). A convenient way for online experimentation to rapidly obtain data from a heterogeneous group of consumers is by crowdsourcing websites such as Prolific or MTurk (Goodman & Paolacci, 2017). Moreover, for cost reasons and ease of access, many studies choose university students as a sample, often criticized for not reflecting the behavior of "real consumers." (Geuens & Pelsmacker, 2017; Jones & Sonner, 2001) However, Geuens and Pelsmacker (2017, p. 86) argue that using student samples is acceptable "as long as they are relevant in the context of the study." When examining a food label within a university canteen (RA 1), for example, it appears reasonable for the sample to consist predominantly of university students. Accordingly, this thesis used student and other random but convenient samples, including samples acquired via crowdsourcing platforms.

In conclusion, it should be noted that behavioral economics traditionally relies on experimental research to gain insights (Camerer et al., 2004). Despite this, several authors argue that a detailed understanding of the context and underlying processes is necessary to better understand (lacking or unintended) effects of behavioral interventions on actual behavior (e.g., Ewert, 2020; Sandere et al., 2018; Sunstein, 2017). Here, qualitative research methods offer an alternative approach using qualitative data to better understand relationships (Böhler et al., 2022).

3.2 Qualitative research methods and mixed methods design

In contrast to the positivist research paradigm, parts of the RAs follow an interpretative research paradigm to gain a better understanding of the mechanisms of action (e.g., RA 1), though no generalizable statements can be made (Groeppel-Klein, 2020; Kuß et al., 2018). Within this research paradigm, a phenomenological research tradition was applied. Instead of revealing a causal relationship based on apriori hypotheses, the phenomenological research tradition focuses on understanding contextual factors (Durdella, 2019). Therefore, this research tradition focuses on lived experiences, which can be examined with qualitative methods like personal interviews (Durdella,

[8] Although some of the studies included in this thesis can be considered quasi-experimental, the term "experiments" will be consistently used instead of "quasi-experiments" for the sake of simplicity.

2019). Compared to quantitative research, which assumes a quantifiable reality, meaning that contextual factors can be measured numerically, qualitative research is based on the assumption of a rather holistic reality in which various context-specific factors that may influence behavior are investigated via verbal or visual recordings (for the following paragraph Böhler et al., 2022). Qualitative research also differs from quantitative research in that the researcher and the object of research are related. In contrast, there is no such relationship in quantitative research due to the use of neutral measuring tools. The most frequently used qualitative research methods include semi-structured and in-depth interviews, focus groups, and observations. To ensure reliability within qualitative research designs, it is recommended to have several independent investigators undertake the data collection and analysis (Büttner, 2009). A qualitative research approach that combines both observations and in-depth interviews is, for example, the use of video-cued thought protocols, in which video recordings of the decision-making situation serve as an aid to recall for retrospective verbalization of a decision-making process (Büttner & Silberer, 2008). Besides the (quasi-)experimental research tradition, a phenomenological research tradition was adopted within this dissertation, particularly in RA 1 (Study 3), by making use of video-cued thought protocols.

To address research questions from different perspectives, researchers may not follow a singular research approach but combine multiple methods into so-called mixed-method approaches (Bowling, 2023; Durdella, 2019). Within a mixed-methods design, researchers can use a combination of quantitative (e.g., experiments) and qualitative (e.g., personal interviews) methods (Böhler et al., 2022). Because more resources are involved, mixed-methods studies often offer more diverse data and, therefore, more extensive insights and recommendations, for example, in the context of policy studies (Durdella, 2019). The mixed-methods design also counteracts the methodological issues of using qualitative and quantitative methods in isolation and is particularly popular in behavioral economics (Camerer et al., 2004).

3.3 Research method framework of this thesis

Within this thesis, quantitative studies (field experiments, laboratory experiments, online experiments) and one qualitative study (video-cued thought protocols) were conducted. The studies focused not only on the investigation of short-term but also long-term effects of behavioral interventions (RA 2, 4, 6). Table 5 provides an overview of the research methods used in the RAs of this doctoral thesis.

Table 5. Overview of research methods

Source: Own illustration

RA	Number of studies	Method	Sample size
1	Study 1: Impact of traffic-light labels (TLLs) on food expectations and food choice	Online experiment	N = 304
	Study 2: TLLs in a real self-service canteen: Testing actual choices	Field experiment	N = 1631
	Study 3: Uncovering food choice motives - Explanations of why TLLs do (not) work	Video-cued thought protocols	N = 24
2	Study 1: Short-term nudging effects	Field experiment	N = 694
	Study 2: Long-term nudging effects	Field experiment	N = 175
3	Study 1: Uncovering (unintended) effects of goal progress	Field experiment	N = 89
4	Study 1: The effect of different social norms (in isolation)	Online experiment	N=185 (T_0) N=138 (T_1).
	Study 2a: The effect of different social norms combined with ecological information	Online experiment	N=448 (T_0) N=251 (T_1)
	Study 2b: The long-term effects of different social norms combined with ecological information	Follow-up survey to study 2a	N = 149 (T_3)
5	Study 1: Uncovering (unintended) effects of socially comparative feedback	Online experiment	N = 470
6	Study 1a: The effect of virtual reality (VR) as an environmental communication tool on behavior in VR and behavioral intentions	Laboratory experiment	N = 167 (T_0)
	Study 1b: The effect of virtual reality (VR) as an environmental communication tool on objective behavior in a real-life buffet	Field experiment	N = 167 (T_1)
	Study 1c: The effect of virtual reality (VR) as an environmental communication tool on long-term real-world behavior	Follow-up survey to study 1a	N = 149 (T_2)

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5 Research articles

The following subchapters contain the six research articles that are at the center of this cumulative dissertation. Their layout and citation style are taken from the current versions in which they are submitted or are under review. Yet, their presentation is adjusted to the style of this dissertation.

5.1 Actions Speak Louder Than Labels: Empirical studies on (lacking) effects and underlying mechanisms of traffic-light-labels on food choice in self-service canteens

First Author: Lisa-Marie Arnold (née Merkl)

Co-Authors: Larissa Diekmann *(University of Bayreuth)*,
Prof. Dr. Claas Christian Germelmann *(University of Bayreuth)*

At the time of publication of this dissertation, this research article has been under review in a scientific journal. Thus, I provide an extended abstract.

Extended Abstract

The use of traffic-light labels (TLLs) to promote healthy food choices is a growing public policy trend in Europe, particularly in Germany. The intent behind these initiatives is to increase the consumption of more nutritionally favorable (green-labeled) products and prevent the consumption of less nutritionally favorable (red-labeled) products, thus improving the overall nutri-tional quality of consumers' food choices (Ducrot et al., 2016; Zlatevska et al., 2023). Although discussions and trials related to TLLs have extended into the gastronomy sector, few studies address this sector (e.g., Abou Jaoudé et al., 2022; Julia et al., 2021; Olstad et al., 2015; Seward et al., 2016). This article aims to explore the (1) effects, (2) underlying mechanisms, and (3) food choice motives associated with TLLs in self-service canteens.

An online experiment (Study 1) and a field study (Study 2) conducted in a university canteen use the Nutri-Score as a TLL. Surprisingly, both studies reveal that the Nutri-Score had limited impact on food choice behavior in this context. Study 1 further illustrates how TLLs affect food expectations (on healthiness, taste and satiety) and thus food choices. Previous investigations of consumers' food choice motives show that the Nutri-Score triggered approach-avoidance tendencies, but in fact, our data show the label prevented participants—in neither the laboratory setting nor the field study—from choosing red-labeled dishes, nor did it lead to an increased number of green-labeled dishes. Additionally, the authors conducted an in-depth investigation on food choice motives (Study 3) using video-cued thought protocols. The results offer insights into why TLLs do (not) work in this setting and carry significant implications for public policy makers contemplating the introduction of TLLs in self-service canteens. The insights can help develop further interventions, policies, or innovations adapted to the context and thus contribute to promoting healthier food choices (Onwezen et al., 2019).

Most extant studies that investigate TLLs were conducted in laboratory settings (Egnell et al., 2019; Finkelstein et al., 2019). However, there are "key differences between lab eating and free-living eating" (Haws et al., 2022, p. 403). With our research, we respond to calls for more controlled field studies with sales data and for more research on the underlying processes of front-of-pack labels (Andrews et al., 2014). Especially the field study highlighted the risks of a "toxic environment", in which immediate food accessibility and quantity can be responsible for unhealthy food choices (Cohen &

Farley, 2008). Given the findings of Study 3, public policy makers, as well as researchers, should always be aware of the importance of various mediating variables and individual food choice motives (e.g., expected healthiness, expected taste, perception of the price–performance ratio), as they proved to have a far more significant impact on food choice at the point of sale than a TLL.

Understanding underlying motives is imperative for developing more efficacious strategies to encourage healthy dietary habits. We emphasize that, ultimately, "food label interventions are only one component in the policy toolkit" (Zlatevska et al. 2023, p. 88). Accordingly, public policy makers should contrast the effect of TLLs with other interventions. We encourage them to take an integrated approach to increase healthy food choices, including not only the simplified presentation of nutritional quality in the form of food labels but additionally using a wide range of policy tools, such as comprehensive educational campaigns, monetary incentives, or more interactive interventions (Schruff-Lim et al., 2023; Zlatevska et al., 2023). In this regard, our studies provide a starting point for future researchers to explore the effect of TLLs, combined with other public policy interventions, with regard to the motives that drive food choice and other factors influencing food choice behavior.

Keywords: *Traffic-Light Label, Nutri-Score, Food Expectations, Healthy Food Choice, Food Choice Motives*

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5.2 Nudging Physical Distance During COVID-19: Short-Term and Long-Term Wear-Out Effects of Nudges in a Retail Setting

First Author: Jannike Harnischmacher *(University of Bayreuth)*

Co-Authors: Lisa-Marie Arnold (née Merkl),
Prof. Dr. Claas Christian Germelmann *(University of Bayreuth)*

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Harnischmacher, J., Merkl, LM., Germelmann, C.C. (2024). Nudging Physical Distance During COVID-19: Short-Term and Long-Term Wear-Out Effects of Nudges in a Retail Setting. In: Jeseo, V., Allen, J. (eds) Welcome to The New Normal: Life After The Chaos. AMSAC 2023. Developments in Marketing Science: *Proceedings of the Academy of Marketing Science*. Springer, Cham. https://doi.org/10.1007/978-3-031-49039-2_19.

A previous version was presented at the ***French-Austrian-German Workshop on Consumer Behavior 2022.***

Abstract

During the COVID-19 pandemic, customers had to adopt new behavior patterns. Keeping distance from others is a key measure and difficult to achieve in crowded retail settings. We examine the effectiveness of nudges in two field studies. In study 1, we investigate the effectiveness of three salience nudges that support distance keeping in a retail setting: duct-taped lines, footprints, and footprints with distance information as a more transparent nudge. Results show greater nudging effects for footprints in comparison with duct-taped lines. The more transparent nudge proved to be the most effective, with 3.3 times greater odds of nudging customers compared with lines. In study 2, we investigate the long-term effect of the transparent salience nudge. Results show a drastically declined nudging effect after one year of exposure. These findings support managers and public policy makers in designing nudges and draw attention to wear-out effects.

Keywords: *COVID-19, Physical Distance, Nudge, Transparency, Semiotics*

5.3 Unlocking the Consequences of Perceived Goal Progress: Does Closing the Activity Ring Lead to Adverse Effects in Smartwatch Usage? - A Field Study

First Author: Lisa-Marie Arnold (née Merkl)

Co-Authors: Prof. Dr. Claas Christian Germelmann *(University of Bayreuth)*,
Moritz Henze *(University of Bayreuth)*,
Johanna Kuhn *(University of Bayreuth)*

At the time of publication of this dissertation, this research article has been under review in a scientific journal. Thus, I provide an extended abstract.

This research article is accepted for presentation at the ***Academy of Marketing Science (AMS) World Marketing Congress 2024****.*

Extended Abstract

The number of smartwatch users worldwide is growing rapidly. One of the most popular smartwatch features is self-tracking of personal Goal Progress. To support users in this endeavor, user interface designers purposefully integrate digital design elements to visualize their Goal Progress. To visualize Goal Progress, several smartwatch companies integrate features such as progress bars or use notifications to inform the user about the status of the Goal Progress (Lembcke et al. 2019). These digital elements intend to encourage users to engage in physical activity in the analog world and motivate them to achieve their daily goals (Lembcke et al. 2019). In this context, the user interface of a smartwatch represents a choice architecture, i.e., an environment in which users make choices in which they are influenced by the design elements that appear there (Thaler & Sunstein 2008). Along with this comes the question of how the visualization of the Goal Progress on a smartwatch affects user behavior and – more specifically, how smartwatch users behave as soon as they have achieved their daily personal goals.

Past studies in the analog world already showed that the achievement of a higher-level goal, and thus the change in the perceived Goal Progress, can lead consumers to behave contrary to the higher-level goal in subsequent decisions (e.g., Schultz et al. 2007). They also showed that design elements in consumers' choice environment can alter perceived Goal Progress and thus trigger adverse effects, such as the “licensing effect” (Khan & Dhar 2006). Such undesirable effects have frequently been studied in consumer behavior research in the analog but rarely in the digital world. Given this, we question if the visualization of Goal Progress might induce rewarding compensatory effects for smartwatch users. More specifically, we examine whether feedback on Goal Progress on a smartwatch leads to adverse effects regarding users' further physical activity or subsequent food choices.

To address the research question, we conducted a (pre-registered) field study (n = 89) with a randomized between-subject design to investigate whether digital design elements that provide smartwatch users feedback on Goal Progress (Step Goal) induce licensing effects within the same (physical activity) or even across other domains (food choice). Results show that Feedback on Goal Progress did neither lead to lower physical activity throughout the day nor increased calorie intake in subjects who achieved their step goal early compared to the control group. Interestingly, in the control group, even

the perception of a not-yet-closed activity ring did not motivate this group to move more during the day to achieve their goal, compared to the experimental group. Therefore, the results of this field study show that, on the one hand, the licensing effect did not occur, but also indicate that the feedback on not achieving a goal did not have a positive, motivating effect on the subjects.

Most past studies dealing with the licensing effect are based on verbal statements of subjects considering hypothetical scenarios but not actual behavior (Khan & Dhar 2006). To measure the effect of design elements influencing behavior in real life, researchers recommend conducting real-world experiments in which consumers' decision-making processes can be studied in a selected context (Ménard 2010; van Kleef & van Trijp 2018). Our field study contributes to consumer behavior research as it reflects the real-world behavior of smartwatch users. The findings provide insights into the behavior of smartwatch users and shed light on the effect of the perceived Goal Progress on physical activity and food choices, as well as the occurrence of licensing effects. No behavior-specific adverse effects were identified in this study, but also no positive Effects of Feedback on Goal Progress on subjects' behavior. From a user interface designer's perspective, this raises the question of which adjustments must be made to the user interface to achieve the desired target behavior. We still highlight the need for increased awareness of responsibility in the design process of user interfaces and underscore that designers of digital user interfaces need to consciously examine the positive and negative effects of digital design elements.

Keywords: *Smartwatches, Digital Nudging, Gamification, Licensing Effect, Field Study, Goal Progress*

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5.4 No Milk Today? Shifting Consumer Behavior Toward Milk Drink Alternatives to Reduce Greenhouse Gases

First Author: Benedikt Brand *(University of Bayreuth)*

Co-Authors: Marie Specht *(University of Bayreuth)*,
Lisa-Marie Arnold (née Merkl)

At the time of publication of this dissertation, this research article has been under review in a scientific journal. Thus, I provide an extended abstract.

Extended Abstract

Politicians and researchers alike reached the consensus that counteracting climate change needs to be realized rapidly and extensively. Since the production of dairy products constitutes one of the most impactful drivers of climate change (Poore and Nemecek, 2018), transforming the demand of more than six billion milk product consumers would have a substantial effect on stopping global warming. Due to economies of scale, transforming consumers' current food consumption patterns will have a vital impact on fighting climate change. In light of the discrepancy between an ever-growing world population and the limited resources of this planet, interventions should be developed and tested in the food shopping setting to nudge consumers' dietary behavior to be more sustainable.

While many consumers report the intention to consume more sustainably, the vast majority are actually not changing their existing consumption patterns (e.g., Brand and Rausch, 2021). One of the main reasons the literature has identified for the discrepancy between intention and behavior is the limited amount of information about sustainable products (e.g., Kitano et al., 2022). Besides, extant literature revealed how social norms can affect consuming more sustainably (Melnyk et al., 2013). However, what yet remains unknown is (i) if more sustainability information combined with different social norms can effectively change food consumption patterns into more sustainable ones, and (ii) if such an intervention will have a long-lasting effect on consumers' behavior. While some studies exist on how to transform extant dairy consumption patterns, current literature (i) omits analyzing the long-term effects of interventions and (ii) is inherent to methodological shortcomings for measuring the intention-behavior gap. To overcome these limitations identified in previous studies, the authors propose two single factorial between-subjects experiments with repeated measures to examine how to effectively change consumers' dairy consumption into a more sustainable one (three studies in total). The experiments were conducted with a control and two experimental groups (with "proximal" and "distant" social norms) in Germany.

The results indicate that social norms alone, as well as ecological sustainability information combined with socially proximal norms, do not significantly increase the consumption of milk drink alternatives (MDAs; $p=0.055$), whereas socially distant norms do ($p=0.004$). Interestingly, the effect of the latter also enables a long-lasting change in consumers' behavior.

The goal of this research (i.e., how to inform consumers in order to make them reflect on their previous dairy consumption and, ultimately, change it to a healthier, eco-friendly one) has been achieved. The study's implications call for a combination of ecological information and social norms (especially distant ones) to effectively transform consumers' MDA purchases (in the long run). Although the results of our study showed promising effects in the short and (for socially distant norms) in the long run, we still recommend monitoring the effectiveness of such interventions over an even longer period.

Keywords: *Sustainable Consumption, Milk, Nutrition, Social Norms, Construal Level Theory, Psychological Distance*

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5.5 Digital Help for those who are already covered - An experimental study on the effects of digital Nudging to promote sustainable behavior

First Author: Lisa-Marie Arnold (née Merkl)

Co-Authors: Felix Wagon *(University of Augsburg)*,
Timo Koch *(University of Bayreuth),*
Dr. Valerie Graf-Drasch *(University of Hohenheim)*,
Prof. Dr. Claas Christian Germelmann *(University of Bayreuth)*

At the time of publication of this dissertation, this research article has been under review in a scientific journal. Thus, I provide an extended abstract.

Extended Abstract

In response to the grand challenges posed by the global threats of climate change, guiding human choice behavior – i.e., "nudging" – towards sustainability gained widespread attention. However, nudging comes with great responsibility. Colleagues of different domains warn against adverse effects of nudging, with outcomes difficult to calculate. Yet, such effects have primarily been reported in the analog world (e.g., Schultz et al., 2007). With the advance of digital technologies, it is our 'digital responsibility' to investigate whether adverse effects also exist in the digital realm – and if so, to master them.

One easy and effective way of nudging people to adopt more sustainable behaviors is the provision of social comparative feedback (Hummel and Maedche, 2019). Digital nudges operating on such social comparative feedback have shown significant impact in various energy-saving contexts (e.g., Ableitner et al., 2018; Di Cosmo and O'Hora, 2017; Loock et al., 2012). However, such social nudges in the analog world have also led to unintended effects (Schultz et al., 2007; Karlin et al., 2015). Since individual choices on energy consumption are no longer made only physically but increasingly through mobile devices and smart home appliances, we investigate these unintended effects of digital social comparative feedback nudges.

We conducted an online experiment (N=470) with a digital nudge that provides social comparative feedback on individuals' energy consumption at home and, therefore, aims to increase environmental sustainability. Our results reveal that while our digital nudge effectively alters the energy consumption of those already behaving in an energy-saving manner, the main target group (i.e., consumers performing worse than the average) remained "untouched." Detecting this novel, not adverse but counter-intuitive effect warrants further investigation and provides important insights into digital technologies effects on consumer behavior.

In theoretical terms, we contribute to literature on the effect of behavioral interventions and boundary conditions of digital nudging to foster more sustainable behavior while managing adverse effects. The limits of our existing knowledge present an opportunity to develop novel theories that are both influential and interesting. In practice, our results may guide choice architects to assess the effectiveness of digital nudges and thus also encourage them to do, e.g., a cost-benefit trade-off before and during the introduction of digital nudges. With our research, we are contributing to the call for

more research on digital nudging and, in this context, also to the call for reporting non-significant results in nudging research to determine publication bias (Hummel & Maedche, 2019). In this regard, the results of this study mark an important starting point for further research exploring the effects of new digital technologies on consumer behavior to finally foster sustainable consumer behavior.

Keywords: *Digital Nudging, Energy Saving, Social Norm, Comparative Feedback, Online Experiment*

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5.6 Shifting from information- to experience-based climate change communication increases pro-environmental behavior via efficacy beliefs

First Author: Adéla Plechatá *(University of Copenhagen)*

Co-Authors: Marijke Hiltje Hielkema *(University of Copenhagen)*,
Lisa Marie Arnold (née Merkl),
Guido Makransky *(University of Copenhagen)*,
Michael Bom Frøst *(University of Copenhagen)*

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Abstract

To reach necessary greenhouse gas emissions targets, behavior change is necessary at the consumer level. However, standard information-based interventions struggle to change environmentally impactful behaviors like beef consumption. Experience-based communication that engages non-analytical systems can be crucial for changing our beliefs that our behavior makes a difference. Immersive virtual reality (VR) in the metaverse represents a shift toward experience-based environmental communication. In this preregistered 2 (VR experience vs. VR information) x 2 (indulgent vs. explicit labeling) study (N = 167), we tested the effectiveness of VR experience-based communication and cost-effective nudging to promote sustainable diets. Label manipulation showed no effect on meat consumption. The VR experience led to stronger pro-environmental intentions and more pro-environmental behavior in VR and real life than the VR information condition. Mediation analyses confirm that experience-based VR communication can enhance people's efficacy beliefs, increasing their intentions and, consequently, reducing beef consumption.

Keywords: *Pro-environmental Behavior, Sustainable Diets, Virtual Reality, Environmental Communication; Behavior Change, Metaverse*

6 Discussion

6.1 Contribution and further research

This thesis aimed to firstly investigate the effectiveness of different types of behavioral interventions in different application contexts and application areas on consumer behavior (RQ 1) and, secondly, to identify the underlying mechanisms and explanations for (unintended or lacking) effects of behavioral interventions (RQ 2). Within six research articles, selected types of behavioral interventions in different application areas have been investigated. The findings provide insights into the effectiveness of selected interventions and, therefore, serve as a "reality-check" contrasting the hypothesized effects (RQ 1). Furthermore, investigations on contextual factors and the underlying mechanisms affecting behavioral interventions' outcomes enhance the understanding of (lacking) effects of behavioral interventions (RQ 2). Concerning the two overarching research questions, this doctoral thesis provides empirical and methodological contributions (Summers, 2001) to TCR, which will be outlined in the following.

6.1.1 Empirical contributions

Regarding RQ 1, the findings across the studies conducted here demonstrate the *unpredictability of the effects* of behavioral interventions. A positive effect of the behavioral intervention on consumer behavior was found, in line with previous assumptions, only for introducing footprints within a supermarket to maintain the specified minimum distance (RA 2) and using experience-based communication techniques to promote pro-environmental behavior (RA 6). In contrast, RA 1, investigating the Nutri-Score in a self-service canteen, shows that contrary to the hypothesized assumptions, the label has no impact on the choice behavior of students in a self-service canteen, both in an online experiment and under natural conditions in a field experiment. It is further shown in RA 4 that ecological sustainability information combined with socially proximal norms does not increase pro-environmental behavior, whereas socially distant norms do. Particularly, in RA 3 and RA 5, the focus is on uncovering unintended effects. Although no adverse effects were found within these studies, feedback on goal progress (RA 3) does not lead to positive effects (e.g., more steps), nor do social norms as reference points (RA 5) lead to a reduction in energy consumption in the target group (above social norm). However, RA 5 also demonstrates a surprising, counter-intuitive effect: contrary to the assumption that downward social comparisons lead to

adverse effects, the use of social norms shows a positive effect in this group.

As such, the results of the studies also illustrate the special role of *interpersonal characteristics and preferences*, which are to be regarded as moderating factors within the decision-making process. Some of the examined interventions indicate that positive effects are often shown within a specific consumer group. For example, RA 5 shows that sex and environmental identity of a person can be seen as a moderating factor in the way social norms work. The results of the qualitative study in RA 1 also illustrate the relevance of individual food choice motives within a self-service canteen, thereby offering an explanation for the lack of effects of the Nutri-Score within this setting (RQ 2).

In addition to individual characteristics and preferences, *context-specific (environmental) factors* play a decisive role in changing consumer behavior. Some studies presented in this thesis took place within a specific context, implying that the results obtained are generalizable or transferable to other contexts only to a limited extent (Stremersch et al., 2023). From a public policy and marketing perspective, however, this limited generalizability represents a benefit rather than a limitation, as the results can be more valuable for a specific stakeholder group (Stremersch et al., 2023). For example, in RA 1, the Nutri-Score was tested within a self-service canteen, showing no positive effects on the overall nutritional quality of food choices. These findings contrast with previous studies on the use of the Nutri-Score on pre-packaged food in supermarkets, where positive effects on food choice were found (e.g., Dubois et al., 2021; van den Akker et al., 2021). Qualitative data collected within RA 1 show that external factors, such as social norms and time pressure, can impact food choices, especially in the self-service canteen context. As such, food choices that must be made under time pressure and for immediate consumption in a self-service canteen differ from choices for packaged food, which can be made consciously, often without time pressure, and are consumed at a later point in time. Contrasting food choices in supermarkets and self-service canteens can be used as an example to illustrate the relevance of uncovering context-specific influential factors, which can be of particular interest to public policymakers and marketers. However, despite this example, it cannot be precluded that behavioral interventions are not applicable to other contexts. For example, footprints have already proven effective as a guideline for consumers in various contexts (e.g., Marshall et al., 2002; van Hoecke et al., 2018). RA 2 extends previous research in this

sense: here, studies within a supermarket have shown that footprints can be used as a guideline for consumers even in this setting despite its particularly high information overload. However, wear-out effects can occur.

Finally, the *understanding of the underlying mechanisms* also contributes to the explanation of the (lacking) effects (RQ 2): While no effects of the labeling intervention in a self-service canteen on consumer choice behavior were found in RA 1, significant mediating variables (such as food expectations) were identified. In this context, food expectations can further explain the lack of positive behavioral effects. RA 6 shows a positive effect of experience-based communication tools on pro-environmental intentions via the two mediating variables, response- and self-efficacy. As such, RA 6 provides a deeper understanding of the mechanisms and, therefore, explanations of the interventions' positive effects. Following a behavioral economics perspective, especially RA 1 and RA 6 show that - as stated by Geuens and Pelsmacker (2017, p. 90) - "[m]oderating and mediating variables often constitute the real contribution of a study."

6.1.2 Methodological contributions

Along with the empirical contributions, there are also methodological contributions to research. Several behavioral interventions were tested under laboratory conditions, for example, within an online experiment (e.g., RA 1, 4, 5). This ensured high internal validity and allowed testing of behavioral patterns and underlying mechanisms such as moderating and mediating variables. As previously described, the decision-making context plays a decisive role in decision-making. Some authors, therefore, criticize the exclusive investigation of interventions within laboratory studies in artificial environments: "A laboratory experiment may point to a considerable potential, but real-life replication does not automatically follow." (van Kleef & van Trijp, 2018, p. 344) With regard to food choices, Haws et al. (2022), for example, discuss significant differences between "lab-eating" and "free-living eating" and thus emphasize the need for more real-world studies. In order to *meet the call for more research in real-life settings* and to be able to make more generalizable statements, some of the behavioral interventions were investigated using carefully designed field experiments (e.g., RA 1, 2, 3, 6). These provide increased external validity compared to laboratory studies.

From a methodological point of view, RA 1 and RA 6 stand out within this thesis. Within these research projects, *both online and field experiment*s were conducted using the same choice setting (i.e., the same range of dishes both online/virtual and in the field), allowing the results from the online experiment to be compared with those from the field experiment about selected variables. In RA 6, for example, an initial food choice was made in a virtual world, precisely modeled on the authentic buffet. After the subsequent choice has been made at an authentic, analog world buffet, the experimenters could compare the food choices made in the virtual world with the behavior in the real world.

Furthermore, for RA 1, the *use of a mixed methods approach* should also be emphasized. By combining qualitative and quantitative data, it was possible not only to obtain statements on the actual, measurable behavior of the consumer but also to gain deeper insights into the underlying mechanisms.

This approach corresponds with recent calls from the literature requesting more *within-person research* to better understand intra-individual processes over time (Childs et al., 2023). This thesis addresses these calls by observing differences between subjects and within-subject changes over a longer time period in two research articles (RA 4, 6). In RA 6, for example, differences between groups were investigated on the one hand. In addition, it was examined to what extent selected intrapersonal variables varied both in the short- and the long-term through behavioral intervention. For this purpose, a repeated measurement of all relevant variables was required. In RA 6, for example, comparing results of the point of measurement T_0 (pre-survey) and T_1 (post-treatment) regarding the subjects' self-efficacy and response-efficacy revealed insights into intraindividual processes, which were triggered by the implementation of the behavioral intervention. Within-person research can, therefore, provide insights into intrapersonal processes. By using these behavioral insights for further development of behavioral interventions, it also can have implications for public policymakers and marketers. Regarding RA 6, for example, revealing the importance of self- and response-efficacy for fostering pro-environmental behavior and, furthermore, gaining insights about appropriate tools to boost those intrapersonal variables can help policymakers and marketers in developing strategies for behavior change.

Finally, it is worth highlighting investigations on the *long-term effects* of behavioral interventions within this thesis: In RA 2, the long-term effects of footprints as position markers within a supermarket were examined ($T_{1=}$ one year after the introduction of behavioral intervention). Moreover, in RA 4, the long-term effect of social norms on pro-environmental behavior was investigated ($T_{1=}$ two days after the experiment; $T_{2=}$ five months after the experiment). RA 6 also examined the lasting effect of visualizations in VR after one week. In this way, it was possible to compare the effects measured at a point in time before and immediately after the intervention and to make statements about the long-term effects or even wear-out effects. Investigating long-term effects is particularly relevant as it provides information on whether behavioral patterns only change in the short term as a response to the present intervention or whether the information communicated can also lead to a long-term change in habits.

6.1.3 Further research

Overall, the results of the studies of this thesis provide new insights into the effectiveness of behavioral intervention in different application contexts and application areas (RQ 1) and into the underlying mechanisms and the variables influencing the outcomes (RQ 2).

The *empirical* findings highlight the importance of understanding 1) the unpredictability of the effects of behavioral interventions, 2) interpersonal characteristics and preferences, 3) context-specific factors, and 4) the underlying mechanisms. These results pave fruitful avenues for future research. First, further research should not only focus on positive or lacking effects but also on unintended effects (Sunstein, 2019; Weinmann et al., 2016). Such analyses are particularly relevant in the case of multiple choices closely related to each other, in which consumers tend to use highlighting or balancing strategies (Dhar & Simonson, 1999). Besides moral licensing, this may include other psychological effects, for example, the “what the hell effect” (Herman et al., 2019; Polivy et al., 2010). In terms of food choices, these may lead to overconsumption. Insights into such behavioral patterns can be relevant not only from a public policy perspective but at the same time also from a marketer's point of view since - as studies have shown - overconsumption can also have a negative impact on the advertised brand (Karremans et al., 2016). Moreover, greater focus should be directed toward personal factors to address target groups in more specific ways and thus potentially increase the effectiveness of behavioral interventions (Lehner et al., 2016). In this

context, it is essential to identify potential moderators to determine who will benefit from the intervention (van Kleef & van Trijp, 2018). Finally, follow-up research could focus on replicating studies to gain insights and "empirical facts" and thus draw more generalizable conclusions from empirical findings (Babin et al., 2021).

From a *methodological* perspective, there remains a call for more studies in real-life settings, as these must examine actual behavior while considering contextual influencing factors. In doing so, the need to focus on behavioral outcomes, i.e., actual behavior such as purchase behavior or actual consumption, instead of behavioral intentions remains (Hulland & Houston, 2021). In view of the large amount of information available in the decision-making context, the use of supplementary methods to investigate the visibility and awareness of behavioral interventions should also be considered. For this purpose, for example, eye-tracking methods may be a suitable tool to verify which information is recognized by consumers and how it needs to be adapted in its design and placement (Baier & Rese, 2020). Additionally, in light of investigations of behavioral interventions using new technologies, future research should be open for adapting and innovating research methods, such as the use of tracking devices, which not only monitor actual behavior but record external as well as internal factors (Foehr & Germelmann, 2022). Moreover, wear-out and lasting behavioral effects were found in this thesis over time. Future research may deal with the lasting effects of behavioral interventions to identify potential tipping points.

Within this doctoral thesis, different types of behavioral interventions were examined in different application contexts and application areas. Since behavioral interventions are effective in a context-specific way, there is a broad field for further investigations within different contexts and areas. Given the ongoing digitalization and development of new approaches to communicate in virtual worlds, future research will open up new levels of investigation: The development of new communication tools (e.g., VR) offers new choice architectures and, with that, a new field for the application and investigation of behavioral interventions. In doing so, it should be noted that behavioral interventions, tested and evaluated in the analog world, cannot readily be transferred to the digital/virtual world due to the different context factors and ways of presenting choice architecture (Lembcke et al., 2019). Furthermore, exchanging data in real-time opens up the possibility of personalized behavioral interventions, which is considered an important area of future research (Mills, 2022). RA 5, for example, showed that

personalized feedback on energy consumption might work for one customer group, whereas others remain untouched. The latter group might possibly benefit from a different type of behavioral intervention and/or a different type of information presented - one approach to personalize behavioral interventions based on real-time data.

Finally, it should be noted that this doctoral thesis does not aim to make statements about which type of behavioral intervention works best in which application context or area [9]. Future research projects should also focus on investigating one type of intervention across different application areas to identify the most effective application area to address the present problem or whether a holistic approach in the sense of implementation across several application areas is helpful.

6.2 Implications for Public Policy and Marketing

Based on the findings of the RAs, several recommendations can be derived for practitioners in both behavioral public policy and social marketing. The following steps adapted from a classic design cycle for non-regulatory behavioral interventions are used to guide these recommendations (Schneider et al., 2018): 1) Defining the goal and understanding the consumers, 2) designing behavioral interventions, and 3) testing and evaluating behavioral interventions.

6.2.1 Defining the goal and understanding the consumers

First, as described in chapters 1 and 2 of this thesis, consumers tend not to act rationally and according to their overarching goals. Instead, they face uncertainties in the decision-making process due to internal and external contextual factors. As a result, consumers tend to be biased in their decisions or choose heuristics to simplify decisions, leading to systemic errors in the decision-making process and, thus, to a gap between behavioral intention and actual behavior. To help consumers overcome this gap, public policymakers and marketers must identify the errors and their triggers in the decision-making process and define an overarching goal within an application context to design behavioral interventions targeting it (Dowling et al., 2020).

[9] Research is underway; see Chapter 10: In this research article (working paper), which is not the focus of this thesis, an overview of the effectiveness of digital nudges is provided with the help of a systematic literature review. This should serve as a guideline for practitioners to decide which type of nudge is suitable for which application context.

As the RAs illustrate, it is essential to understand and incorporate consumers' *interpersonal characteristics* and *individual goals, motives,* and *preferences*, as these can significantly influence the effectiveness of behavioral interventions. Accordingly, the findings illustrate that the target group of the behavioral intervention needs to be precisely defined in advance since the effects of behavioral interventions can be group- or person-specific (e.g., RA 5). It has, therefore, been shown that behavioral interventions cannot offer a *one-size-fits-all* solution (Johnson et al., 2012). In this respect, however, opportunities open up when using behavioral interventions in the digital and virtual world, in which behavioral interventions can be designed to be person-specific and thus support the respective recipient individually (Schneider et al., 2018).

At the same time, the results of the field experiment from RA 1 highlight the *importance of the decision-making context*. The respondents in RA 1 stated that they had to make food choices at the point of sale in a context of numerous external (e.g., time pressure) and internal (e.g., hunger) factors. Therefore, researchers must carefully consider the different facets of the decision-making context, as the context can significantly impact various stages in the decision process (Johns, 2006). In this context, Banerjee and Mitra (2023) emphasize that welfare-enhancing behavioral public policies are mostly implemented within a social complex. Notably, policymakers and marketers should be aware of the contextual factors, especially in the design of behavioral interventions.

6.2.2 Designing behavioral interventions

Practitioners can further use *insights into the underlying mechanisms of behavioral interventions* to design effective interventions. In RA 1, for example, subjects reported that several other motives in making food choices in a self-service canteen play a far more significant role in the decision-making process than the nutritional quality of the dishes. Compared to simply labeling the nutritional quality of the dishes, addressing motives within this context, such as the taste, price, or appearance of the food, within behavioral interventions can have a significant impact.

Further, the *timing of behavioral interventions* plays a significant role in this regard. It is advisable to shift the behavioral intervention and, with that, the decision-making process to a point in time when consumers can better process the incoming information. For this purpose, *behavioral interventions in different application areas* are recommended. For example, information on the nutritional quality of food could be

made available in advance in a digitized menu, or consumers could even be motivated to make a food choice at an earlier point in time. This way of influencing behaviors in the analog world through interventions in the digital or virtual world is also demonstrated within RA 5 and RA 6. This leads to recommendations for using behavioral interventions in different application areas to influence behaviors not only within the respective application area but also across different areas.

In addition, recommendations for designing behavioral interventions can be derived: RA 6, for example, highlights the power of *experience-based interventions* compared to the sole provision of information. Driven by the rapid evolution of communication tools, the benefits of shifting from traditional information-based to more experience-based communication are being discussed in marketing communication in particular (Herrmann & Ford, 2023). Further, RA 2 and RA 4 show that *providing information in a simple way*, e.g., in the form of pictures or human-like shapes, proves to be effective. Beyond that, RA 4 also shows that the effectiveness of the behavioral interventions depends on the type of social comparison (e.g., upward vs. downward social comparison). This leads to the conclusion that it is important to be careful in deciding not only how but also *which type of information* is provided. Further, RA 2 shows that increasing *transparency* in the design of behavioral interventions can improve their effectiveness. This contradicts a widely held opinion in the literature, which states that behavioral interventions “work best in the dark” (Bovens, 2009, p. 217). This is based on the assumption that consumers might react adversely to a tactic for behavioral change if they consider it inappropriate or even manipulative (Germelmann et al., 2020). Consequently, disclosing the intention of the behavioral intervention or the desired behavior might lead to reactance behavior (Brehm, 1966). RA 2 provides counter-evidence by demonstrating that providing information about the purpose of a behavioral intervention can enhance the desired effect (see also Bruns et al., 2018; Gold et al., 2020). This is in line with past studies that have shown that transparency may increase (or does not harm) the effectiveness of an intervention (Bruns et al., 2018; Michels et al., 2021; Paunov et al., 2019; Steffel et al., 2016), especially if the added value for the individual ("pro-self"), but also the added value for the common good ("pro-social") becomes apparent to the addressee (Hagman et al., 2015). Transparency should, therefore, serve as a key principle (Hansen & Jespersen, 2013; Sunstein, 2015), especially in the health and sustainability context, and at the same time, function as an instrument to mitigate manipulative concerns in the design of ethically acceptable behavioral

interventions (Bruns et al., 2018; Paunov et al., 2019).

Finally, this thesis demonstrates that a *combination of behavioral interventions with context-specific information* can be effective (RA 2, 4). This is also supported by other authors who emphasize that for successful behavior change, several options from the policy toolbox should be combined (Zlatevska et al., 2023). Within this context, Schmidt (2022) also emphasizes the relevance of a carefully designed "choice infrastructure." She argues that choice architecture tools are the key elements for changing behavior but must be embedded in a suitable "ecosystem within which stakeholder activities and behavioral interventions occur." (Schmidt, 2022, p. 5) For behavioral public policymakers in particular, a broader perspective is recommended to combat environmental and health-related challenges, i.e., shifting away from single behavioral interventions within a choice architecture toward a more comprehensive approach.

6.2.3 Testing and evaluating behavioral interventions

The thesis' results also illustrate the unpredictability of the effects of behavioral interventions on consumer behavior. Consequently, an important practical implication is the necessity to test, evaluate, and monitor the effects of behavioral interventions. Testing behavioral interventions is strongly emphasized in guidelines for successful behavioral interventions since it has been shown that behavioral interventions often do not show the expected effects in reality (Sunstein, 2019). One example is the introduction of the Nutri-Score in a self-service canteen (see RA 1): past studies have shown that a traffic-light label on food is particularly suitable as a consumer aid for choosing healthier foods. The Nutri-Score has been used on selected foods in German supermarkets since 2019 and was, thus, chosen as the stimulus material in RA 1. This means that consumers were familiar with the label from other contexts. Surprisingly, the results of the field experiment in RA 1 do not show any changes in consumers' choice behavior. The limited effectiveness of the Nutri-Score in other settings is also supported by a recent survey on nutrition, which shows that around 61% of Germans do not follow the Nutri-Score or are unaware of it, and only 5 % are strongly guided by it during shopping (Techniker Krankenkasse, 2023). However, it is important to note that although an intervention may not have worked in one area, it could be more suitable for another.

Following this, the recommendation is to specifically *monitor wear-out effects*. RA 2 illustrates that the use of salience has promising effects in the short term but that its effectiveness can decrease drastically over time. Since the introduction of certain types

of behavioral interventions - especially in the analog world - involves high use of resources, practitioners are advised to continuously monitor the interventions' effectiveness and weigh up the costs and benefits. Although behavioral interventions such as food labels or footprints on the floor may initially seem inexpensive from a financial point of view, nonetheless the costs in terms of time required to implement such interventions, particularly in the analog world, should not be underestimated. Introducing behavioral interventions in the digital and virtual world offers exceptionally uncomplicated opportunities to evaluate the effects over time (Schneider et al., 2018).

7 Overall conclusion

Although consumers intend to engage in healthy and environmentally friendly behaviors, reality shows a gap between behavioral intentions and actual behavior. To policymakers and marketers, non-regulatory behavioral interventions based on behavioral economics offer a promising tool for changing consumer behavior. However, past research shows mixed or unintended effects of behavioral interventions, raising the question: Do non-regulatory behavioral interventions keep up to their promise of making the world a better place?

This dissertation aimed to investigate and evaluate the implementation of different types of non-regulatory behavioral interventions that can be used either as a public policy tool or as part of a social marketing strategy. Based on the two overarching research questions - (1) *How effective are different types of behavioral interventions in different application areas and application contexts*? and (2) *How can unintended or lacking effects of behavioral interventions be explained*? - the use of selected behavioral interventions for the common good was investigated across six research articles (integrated into the ACAA matrix). Following a transformative consumer research approach involving qualitative, quantitative, and mixed methods, behavioral interventions were empirically examined in the application contexts of health and sustainability in analog, digital, and virtual application areas.

This thesis provides empirical and methodological contributions to TCR: findings across different research projects reveal 1) the unpredictability of the effects of behavioral interventions, 2) the importance of considering interpersonal characteristics and preferences, as well as 3) context-specific factors, and 4) the relevance of a deeper understanding of the underlying mechanisms. From a methodological point, the studies integrated into this thesis emphasize the vital use of both quantitative and qualitative, but especially of mixed research methods to gain insights not only into the effectiveness of behavioral interventions but also a deeper understanding of decision-making processes and contextual factors influencing consumer behavior. Besides, they underline the relevance of studies in natural choice environments to investigate actual behavior and the importance of controlled laboratory experiments to investigate underlying psychological mechanisms. Furthermore, based on the findings of the RAs, which show opportunities but also limitations of using behavioral interventions for behavior

change in different application contexts and areas, new avenues for future research are discussed. Additionally, this thesis offers valuable recommendations for the use of behavioral insights for the (further) development of successful behavioral interventions in the context of behavioral public policy and social marketing. Following steps in the design cycle for behavioral interventions, recommendations are drawn in view of 1) defining the goal and understanding the consumers, 2) designing behavioral interventions, and 3) testing and evaluating behavioral interventions.

As an overall conclusion from the RAs, it can be stated that non-regulatory behavioral interventions can indeed serve as a tool to build a bridge between behavioral intention and intended behavior and thus target systematic errors such as present bias or absent-mindedness in the decision-making process. Practitioners in the field of public policy and marketing should be aware that choice architecture always affects consumer behavior, even if no deliberate attempts have been made to design them in a specific way to shape behavior (Thaler & Sunstein, 2008). It is, therefore, essential to gain insights into the (unintended) effects of behavioral interventions in different application areas along with the underlying mechanisms (Weinmann et al., 2016). However, in response to RQ 1, it should be noted that the effectiveness of non-regulatory behavioral interventions in promoting healthy and pro-environmental behaviors strongly depends not only on the context but also on individual personal characteristics. To this end - and with regard to RQ 2 - the studies conducted in this thesis provide novel insights on the effectiveness of various behavioral interventions, which also provide intervention-specific explanations for how and why behavioral interventions do (not) change behavior. Yet, it requires more than just single behavioral interventions to "improve consumer welfare and quality of life for all beings affected by consumption across the world." (Association for Consumer Research, 2024) Drawing on insights from behavioral economics, policymakers and marketers are encouraged to develop holistic approaches that can unfold their impact across application contexts and areas. Given growing digitalization and the rise of virtual worlds, implementing behavioral interventions beyond the analog world offers new potential for behavior change – to make the world a better place.

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9 Appendix

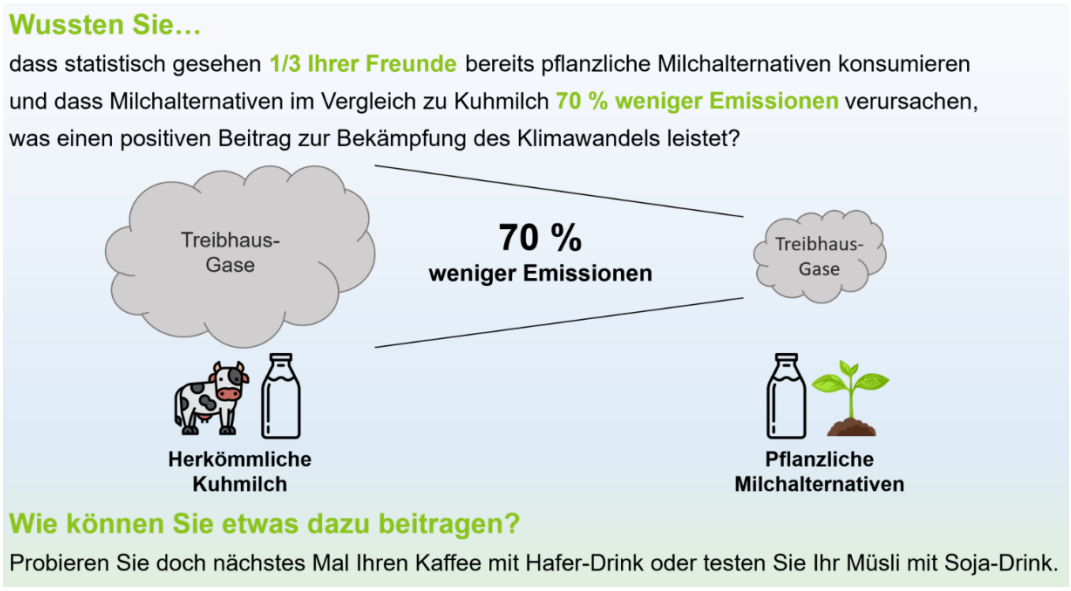
Appendix A: Full-size pictures of the tools investigated in this doctoral thesis

- **RA 1:** Traffic-light label *(Nutri-Score)*

- **RA 2:** Anthropomorphic sign *(Footprints)*

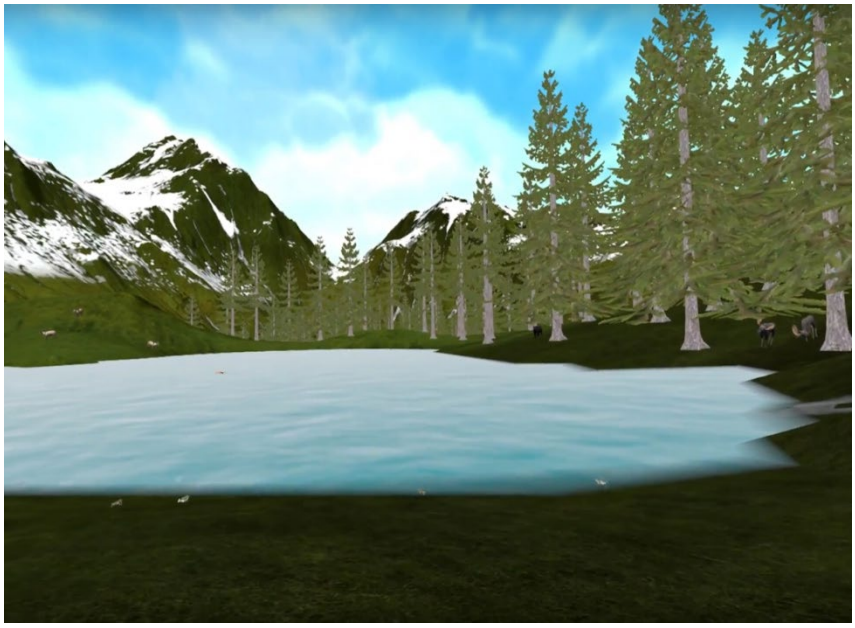
- **RA 3:** Feedback on goal progress *(Smartwatch)*

- **RA 4:** Information using social comparison *(Animation)*



- **RA 5:** Socially comparative feedback *(Smart Home App)*

- **RA 6:** Virtual reality *(Visualization)*



10 Additional research article

The following research article is not included in this doctoral thesis.

Digital Nudging - A systematic literature review on the effects of digital nudges, recommendations, and potential for future research

First Author: Doreen Schick *(University of Bayreuth)*

Co-Authors: Lisa-Marie Merkl,
Anna Wolf *(University of Bayreuth)*,
Prof. Dr. Claas Christian Germelmann *(University of Bayreuth)*,
Prof. Dr. Torsten Eymann *(University of Bayreuth)*