Towards a Broader Understanding of Sustainable Consumption: Applying Psychological Insights for Evidence-Based Interventions

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List of Appended Papers

This dissertation is based on the work described in the following papers:

Paper 1:

Betzler, S., Kempen, R., & Mueller, K. (2022). Predicting sustainable consumption behavior: knowledge-based, value-based, emotional and rational influences on mobile phone, food and fashion consumption. *International Journal of Sustainable Development & World Ecology, 29*(2), 125-138. https://doi.org/10.1080/13504509.2021.1930272

Paper 2:

Kempen, R., & Betzler, S. (2021). More than a thousand words? The effect of photographic material on problem awareness and behavioral intentions regarding the sustainable consumption of mobile phones. *Cleaner and Responsible Consumption 3*, 100018. https://doi.org/10.1016/j.clrc.2021.100018

Paper 3:

Betzler, S. & Kempen, R. (under review). Strengthening sustainable consumption competence in high school students: Evaluation of an experiential training intervention. *Environmental Education Research.*

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Abstract

To solve the global crises related to climate change, joint global efforts of multiple stakeholders, including politics, the private sector, and individuals, are needed. On an individual level, current unsustainable consumption patterns have been linked to a myriad of environmental and social sustainability challenges, making the consumer a key actor in the sustainability transition. Thus, it is important to understand what drives individuals to act sustainably and how these drivers can be targeted to promote sustainable consumption. The present research aims to address this need by identifying key influences on sustainable consumption in different domains and proposes an evidence-based educational intervention to promote sustainable consumption. Three different papers, encompassing five studies using correlational survey, experimental and longitudinal methods, are included. First, psychological determinants from different research streams are integrated as predictors of sustainable consumption. Paper 1 finds knowledge-based, value-based, emotional and rational determinants to be generally predictive for sustainable consumption behavior of mobile phones, food, and fashion, with product-specific patterns emerging. Second, emotional processes are further examined as external antecedents of selected knowledge-based and rational determinants. Specifically, results of paper 2 highlight the importance of negative emotion-evoking photographic material in combination with a text appeal to raise problem awareness for the sustainability challenges of mobile phone consumption. Third, insights are applied in an educational intervention and evaluated in a field experiment in a school. Paper 3 indicates the long-term effectiveness of an experiential training intervention on knowledge-based, emotional, rational, and behavioral sustainable consumption outcomes. Overall, the appended studies contribute to identifying effective leverage points to promote sustainable consumption. This offers valuable scientific insights for designing evidence-based interventions, such as in education or marketing, and will be of significant interest to both researchers and policymakers.

Keywords: sustainable consumption, psychological determinants, emotion-evoking photographic material, evidence-based intervention

Thesis supervisor: Prof. Dr. Karsten Müller

Zusammenfassung

Die Lösung der mit dem Klimawandel in Verbindung stehenden globalen Krisen erfordert eine gemeinsame globale Anstrengung verschiedener Akteur:innen, darunter politische Entscheidungsträger:innen, die Privatwirtschaft und Individuen. Derzeitige nicht-nachhaltige Konsummuster auf individueller Ebene sind mit vielfältigen ökologischen und sozialen Nachhaltigkeitsproblematiken verbunden. Konsument:innen nehmen daher eine Schlüsselrolle in der Nachhaltigkeitstransformation ein. Deshalb ist es wichtig zu verstehen, was Individuen zu nachhaltigem Handeln veranlasst und wie diese Faktoren zur Förderung eines nachhaltigen Konsums adressiert werden können. Vor diesem Hintergrund berücksichtigt die vorliegende Dissertation verschiedene Einflussfaktoren auf nachhaltigen Konsum in verschiedenen Konsumbereichen und nutzt diese Kenntnisse als Grundlage für eine evidenzbasierte Intervention zur Förderung nachhaltigen Konsums. Es werden drei verschiedene Arbeiten einbezogen, die fünf Studien mit korrelativer, experimenteller und Längsschnittmethodik umfassen. Erstens werden psychologische Determinanten aus verschiedenen Forschungsströmungen als Prädiktoren für nachhaltigen Konsum integriert. Der erste Beitrag legt nahe, dass wissensbasierte, wertbasierte, emotionale und rationale Determinanten im Allgemeinen nachhaltiges Konsumverhalten bei Mobiltelefonen, Lebensmitteln und Mode vorhersagen, wobei sich produktspezifische Muster herausbilden. Zweitens werden emotionale Prozesse als externe Einflüsse auf ausgewählte wissensbasierte und rationale psychologische Determinanten weitergehend untersucht. Die Ergebnisse des zweiten Beitrags zeigen insbesondere, wie wichtig negatives, emotionserregendes fotografisches Material in Kombination mit einem Textappell ist, um Problembewusstsein für die Nachhaltigkeitsherausforderungen des Konsums von Mobiltelefonen zu stärken. Drittens werden die Erkenntnisse in einer Intervention im Bildungsbereich angewendet und in einem Feldexperiment in einer Schule evaluiert. Der dritte Beitrag legt nahe, dass die erfahrungsbasierte Intervention langfristig wirksam ist, um wissensbasierte, emotionale, rationale und verhaltensbezogene Faktoren in Bezug auf nachhaltigen Konsum zu stärken. Insgesamt tragen die eingeschlossenen Studien dazu bei, wirksame Stellschrauben zur Förderung von nachhaltigem Konsum zu identifizieren. Dies bietet eine wissenschaftliche Orientierung zur Gestaltung evidenzbasierter Interventionen, z.B. im Bildungsbereich oder Marketing, welche für Forscher:innen und politische Entscheidungsträger:innen gleichermaßen relevant ist.

Betreuer: Prof. Dr. Karsten Müller

1. Introduction

With polar ice caps melting, extreme weather events skyrocketing and CO_2 emissions far from under control, sustainable development currently constitutes the greatest challenge of humankind. As humanity continues to transgress planetary boundaries (Rockstroem et al., 2009), it is beyond doubt that human-made climate change has and will continue to have profound impacts on both ecosystems and human life taking place within them. In their latest report, the Intergovernmental Panel on Climate Change (IPCC) projects scenarios of different degrees of adaptation efforts and paints a disastrous picture of the future in case of inaction (Intergovernmental Panel on Climate Change [IPCC], 2023). Thus, with all aspects of human life being affected, the need for substantial changes to tackle the challenges ahead of us is more urgent than ever.

Paving the way for this change has been on the political mainstream agenda for at least 50 years. In 1972, the Club of Rome issued its report "The Limits of Growth" (Meadows et al., 1972), criticizing resource-intensive ways of living and stimulating a broad discussion of the topic. In 1987, the World Commission on Environment and Development issued the Brundtland report including its iconic definition of sustainable development as meeting "the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987 p. 43). The declaration of the 17 sustainable development goals (SDGs) in the 2030 Agenda for Sustainable Development is often referred to as a (temporary) culmination of these previous efforts (Fischer et al., 2023).

Achieving the SDGs requires immense joint global efforts at all levels from multiple stakeholders, including governments, companies and individuals around the world (Gusmão Caiado et al., 2018; Huang & Rust, 2011). In this context, individual unsustainable consumption has been consistently linked to negative environmental impacts like high levels of greenhouse gas emissions (Shwom & Lorenzen, 2012) or biodiversity loss (Wilting et al., 2017). In the political arena, this is reflected in SDG 12, calling for more responsible consumption and production patterns (UN, 2015). Consequently, a growing consideration of the role of the individual consumer has been a major claim in sustainability science (Brown, 2012), and different avenues for inciting more impactful sustainable consumption[1] behavior change have been proposed (Di Giulio et al., 2014; S. M. Geiger et al., 2018).

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[1] In the present work, following Fischer and colleagues (2023), the term sustainable *consumption* encompasses different acts of consumption along the life cycle of products, from assessment over use to disposal or recycling. In accordance with the Brundtland report (1987), *sustainable* consumption enables satisfying needs without compromising the ability for others to satisfy their needs today or in the future. Also, it particularly considers both social and environmental dimensions of consumption impacts.

In this endeavor, environmental psychology yields valuable insights by broadening our understanding of the interaction between the physical environment and individuals' perceptions, behavior, or well-being. It is concerned with how "individuals change their environments, and their behavior and experiences are changed by their environments" (Gifford et al., 2011, p. 440). These two directions of examination have vastly characterized the field.

A first major concern consists in explaining and changing "environmental behavior to create a healthy and sustainable environment" (Steg et al., 2018, p. 4) by identifying predictors for sustainable behaviors (Gifford et al., 2011). Thus, an expanding body of research focuses on disentangling the psychological influences of sustainable consumption behavior (Quoquab & Mohammad, 2020; van Valkengoed et al., 2022). It aims at identifying predictors and antecedents as points of departure to promote sustainable consumption. Reviews and meta-analytical research have examined personal, social or contextual antecedents from different theoretical frameworks (Bamberg & Moeser, 2007; Blankenberg & Alhusen, 2019; Gifford & Nilsson, 2014; Kollmuss & Agyeman, 2002). Likewise, on the outcome level, a vast array of target behaviors of sustainable consumption and related product groups has been studied (Abrahamse et al., 2005; J. L. Geiger et al., 2019; Gossen et al., 2023; Han & Hansen, 2012; Iran et al., 2019).

The identification of psychological determinants for sustainable consumption behavior poses the question of how they can be successfully stimulated. Thus, a second major concern consists in examining influences from the individual's environment on psychological processes (Pol, 2006), which can then be addressed in interventions to incite sustainable behavior change (van Valkengoed et al., 2022). In sustainability communication, designing processes of information and communication including various visual or verbal (Kruse, 2011) or emotional and experience-oriented aspects (Reisch & Bietz, 2011) have been highlighted. Specifically, as reflected in both scientific (e.g., Chapman et al., 2016; Rebich-Hespanha & Rice, 2016; Reisch & Bietz, 2011) and practice-oriented (Markowitz et al., 2014; Schrader et al., 2022) publications, visuals and photographic material constitute central elements for communication aimed to foster sustainable consumption effectively, as it serves important emotional and motivational functions (Bradley et al., 2001; Nascimento et al., 2008).

Current research on sustainable consumption behavior combines these two perspectives, seizing the interplay of factors external (environmental) and internal (psychological) to the individual (Qin & Song, 2022; Steg & de Groot, 2019). Using external cues to promote sustainable consumption through psychological processes yields important

applications for media-based interventions like awareness or social marketing campaigns (Gossen et al., 2019; Green et al., 2019). Meta-analytical research suggests favorable effects of sustainability social marketing campaigns on knowledge or behavioral outcomes (Green et al., 2019). In their typology of sustainable consumption communication research, Fischer and colleagues (2021) refer to this as *Type I communication*, including information or persuasion strategies targeted at individual behavior change of consumers. Further, *Type II communication* (Fischer et al., 2021) targets change through capacity building, e.g., through boosting or consumer information and education. Sustainable consumption interventions in the educational sector constitute a typical area of application. Reviews and meta-analytical research suggest positive effects of educational interventions mostly on different forms of knowledge and rational outcomes such as attitude or behavioral intention (Ardoin et al., 2018; van de Wetering et al., 2022). Also, some initial evidence on effects of mindfulness interventions on value-based outcomes exists (Fischer et al., 2017). Thus, educational interventions have the potential to provoke more profound changes by engaging individuals actively with sustainable consumption topics and self-empower consumers.

However, despite increasing insights on how to effectively target psychological outcomes in interventions to promote sustainable consumption behavior, several open questions still remain. From a conceptual perspective, many individual theories have been employed to predict sustainable consumption behavior (Quoquab & Mohammad, 2020), making the field scattered in terms of theoretical conceptualization. Further, studies oftentimes examine isolated target behaviors, focusing solely on behavior in one consumption area (e.g., mobility, energy conservation). Thus, a stronger integration of psychological determinants from different theoretical approaches is called for in order to explain and predict sustainable consumption behavior more broadly (e.g., Bamberg & Moeser, 2007; Klöckner, 2013). In particular, the inclusion of emotional and value-based influences seems underrepresented. Also, contrasting this integrative consideration of influences for different sustainable consumption areas and product groups is needed (Onel, 2023). This contributes to our understanding of which factors need strengthening in which consumption area in order to promote sustainable consumption behavior on a larger scale. Following this reasoning, there is a need to understand which external factors can facilitate these internal psychological processes. In this context, the various activating effects of emotions seem to be an important factor to consider (Carrus et al., 2008; O'Neill & Nicholson-Cole, 2009; van Valkengoed et al., 2022). In combination with visual content, they constitute a powerful tool. Yet, little is still known about the effects of visual content on individuals in sustainable consumption

communication (Duan et al., 2021; Metag et al., 2016). Examining the effects of emotion-evoking material on psychological outcomes contributes to our understanding of the importance of emotional influences for sustainable consumption behavior. Also, it supports points of departure on how to address relevant psychological determinants adequately in intervention measures, such as in awareness and social marketing campaigns (Green et al., 2019).

From a practical perspective, an integrative consideration of psychological determinants including emotional and value-based factors in educational interventions remains scarce. Also, existing educational interventions largely focus on environmental dimensions of sustainability, neglecting the social dimension which is of particular importance in certain product-related consumption domains like the food or fashion sector. Thus, based on the theoretical integration of psychological influences, developing and evaluating the effectiveness of educational interventions addressing this variety while specifically accounting for the complex effects of emotional processes is of great interest. For a broader conceptualization of sustainability, interventions should encompass environmental and social facets of sustainability alike. This contributes to our understanding of successful training interventions that can be practically implemented in specific educational settings and with specific target groups. Children and adolescents have been attributed a particular relevance in the sustainability transformation, as they are highly affected by climate change and very concerned about and motivated to contribute to sustainable change (Thomaes et al., 2023; von Braun, 2017). In sum, the studies included in the present work strive to add to the current debate on how to promote sustainable consumption effectively by integrating individual determinants in different consumption areas and integrating this knowledge to obtain effective intervention approaches.

In the following, four major theoretical streams identified in the literature will be presented as relevant psychological determinants of sustainable consumption behavior. Subsequently, in the quest to identify external influences on these psychological determinants, research on emotion-evoking visual material relevant for successful sustainable consumption communication will be introduced, taking account of the relative negligence of emotions in the formation of sustainable consumption behavior. Especially, the activating effect of emotional influences on psychological processes will be focused. Based on this integrated theoretical perspective, research on the evaluation of effective training interventions in the educational context will be reviewed. Finally, the contributions of the present research will be elaborated.

1.1 Acknowledging the Complex Individual: An Integrative View of Psychological Determinants of Sustainable Consumption Behavior

A growing body of research on psychological determinants of sustainable consumption behavior suggests that individuals are subject to a myriad of influences when they consume, making sustainable consumption a complex issue (Buerke, 2016; Di Giulio et al., 2014). In the quest of understanding the individual's influence on its environment and identifying potential leverage points to modify behavioral impacts, different theoretical streams predicting and explaining sustainable consumption behavior can be observed in the literature (Haider et al., 2022; Jackson, 2005). In this context, knowledge-based, value-based, emotional and rational factors have received varying attention.

First, various reviews and meta-analyses point to knowledge and awareness as relevant antecedents for sustainable consumption behavior (Gifford & Nilsson, 2014; van Valkengoed et al., 2022). The Consumer Decision Process model (Blackwell et al., 2006) includes the search for information about a product or service as an essential step in order to acquire relevant knowledge before consuming. The reasoning of the knowledge deficit model (Schultz, 2002) suggests that providing individuals with relevant information eventually leads to behavior change. Kollmuss and Agyeman (2002) conceptualized knowledge to be part of a wider factor of environmental consciousness as a necessary basis for acting sustainably. Empirically, different knowledge-related factors, including problem awareness as an important indirect predictor on sustainable consumption behavior, have been validated (for meta-analyses, see Bamberg & Moeser, 2007; van Valkengoed et al., 2022).

Second, individuals' values have been known to be influential to predict sustainable consumption behavior (Steg, 2023). In this context, the Value-Belief-Norm-Theory (VBN; P. C. Stern, 2000) aims at predicting different sustainable public and private sphere behaviors, including sustainable consumption. It assumes that certain values, such as biospheric (i.e., sustainability-endorsing) or altruistic values, act as a basis for individuals' awareness of consequences of a certain environmentally-relevant action. This in turn affects an ascription of responsibility to promote positive or prevent negative consequences from one's own action, and a resulting personal norm to act in a certain way. Empirically, the VBN has been validated in various sustainable consumption contexts (Hartmann et al., 2018; Landon et al., 2018; Onel, 2023).

Third, the literature on decision-making has acknowledged the influence of emotional factors (Lerner et al., 2015), constituting a valuable perspective for sustainable consumption.

As Decision Affect Theory (Mellers & McGraw, 2001) states, especially the anticipation of self-conscious emotions like pride or guilt is powerful in incentivizing the individual to evaluate the own behavior in reference to a social norm to maximize positive outcomes for the self. In contrast, Steenhaut and van Kenhove's (2006) ethical decision-making framework stress the significance of anticipated guilt to act in accordance with ethical beliefs. Empirically, there is vast evidence for the importance of self-conscious emotions for sustainable consumption behavior (Onwezen et al., 2013; Schneider et al., 2017; for meta-analyses, see Bamberg & Moeser, 2007; Shipley & van Riper, 2022).

Fourth, a strong focus on social-cognitive processes can be identified in the literature to explain sustainable consumption behavior. In this respect, the Theory of Planned Behavior (TPB; Ajzen, 1991) assumes a person's attitude, social norms in the person's environment, and perceived behavioral control to predict intention to act and eventually, the behavior itself. Thus, the theory considers individual and social influences as well as external constraints and assumes that consumers weigh those influences rationally in decision-making, such as when considering different (un)sustainable behavioral alternatives. Empirically, rational influences have been proven to be of relevance in a variety of sustainable consumption contexts (for reviews or meta-analyses, see Han & Hansen, 2012; Yuriev et al., 2020).

All of the above-mentioned research streams have contributed to the literature to predict sustainable consumption in different consumption domains. The current state of research indicates that it is indispensable to consider these different determinants together, partly integrating them to heighten predictability of different sustainability-related behaviors (Bamberg & Moeser, 2007; Klöckner, 2013; for an overview of meta-analyses, see van Valkengoed et al., 2022). However, most attempts of integration are based on one major theoretical model, with a clear dominance of the TPB (Haider et al., 2022), and an integration of the presented theoretical streams is still lacking. Further, insights from previous research vary regarding the relative importance of included determinants for different outcome behaviors of sustainable consumption, such as mobility choices (Bamberg et al., 2007) or recycling behavior (J. L. Geiger et al., 2019). Regarding product-related consumption, varying product groups have been examined (Gossen et al., 2023; Han & Hansen, 2012; Iran et al., 2019). However, studies contrasting different outcome behaviors remain scarce. Thus, the present research aims to integrate knowledge-based and awareness, value-based, emotional and cognitive determinants of sustainable consumption behavior for the three consumption areas of food, fashion and mobile phone consumption. This is of great importance for contrasting the strength of the relationships in different consumption areas,

and provides points of departure for tailored, product-specific interventions for behavior change.

1.2 Considering External Antecedents: Evoking Emotions Through Visuals to Target Psychological Determinants in Sustainable Consumption Communication

While identifying psychological determinants from different theoretical streams for sustainable consumption is valuable, it does not provide detailed insights into intervention-related variables. Therefore, it is necessary to investigate the effect of potential antecedents of the previously explicated psychological determinants to provide an evidence-based foundation for successful interventions. While the theoretical integration of the model streams suggests emotional and value-based factors to be of great importance, a strong focus of intervention approaches targeting rational and knowledge-based influences can be registered. However, the activating effect of emotions on psychological processes is of high relevance to communication interventions, especially for type I communication (Fischer et al., 2021) targeting consumer behavior change, for example through awareness and social marketing campaigns. Meta-analytical research suggests positive effects of sustainability awareness campaigns on psychological outcomes such as knowledge, behavioral intentions, or conservation behavior (Green et al., 2019).

In this context, as is known from research on campaigning or health interventions, pictures and photographic material are particularly relevant for evoking emotional reactions (Chapman et al., 2016; Nascimento et al., 2008), which are linked to motivational states (Bradley et al., 2001). Two relevant components of pictures can be identified: their perceived hedonic valence (i.e., how (un)pleasant a picture is evaluated) and the elicited arousal (i.e., physiological activation) resulting from the picture, consequently provoking an appetitive or defensive motivation that determines resulting behavioral patterns (Bradley et al., 2001). Specifically, based on the negative asymmetry effect (Kanouse, 1984) stating that negative information is weighed more strongly than positive information, negative visual material evokes stronger emotions and empathy (Bagozzi & Moore, 1994; Small & Verrochi, 2009). Anticipated negative emotions then provoke a stronger desire to act sustainably (Carrus et al., 2008). Likewise, as previously demonstrated, emotional influences have been established as relevant predictors for sustainable consumption behaviors (Bamberg & Moeser, 2007; Onwezen et al., 2013).

Following this line of reasoning, emotion-evoking visuals and photographic material constitute a powerful tool for persuasive communication (Lazard & Atkinson, 2015; Mitchell,

1986). For example, they have proven effective in campaigns promoting the consumption of eco-friendly products (Marroquín-Ciendúa et al., 2023). This is because visual representations are an effective means to frame information (Rebich-Hespanha & Rice, 2016) or attract the viewer's attention (O'Neill & Nicholson-Cole, 2009). As photographic material can exemplify abstract content (Zillmann, 2002), it can simplify information or make messages more memorable (O'Neill & Nicholson-Cole, 2009). Based on dual coding theory (Clark & Paivio, 1991) as well as the cognitive theory of multimedia learning (R. E. Mayer, 2005), a visual or pictorial and an auditive or verbal channel is used to process information. Combining visual and verbal elements is effective to enhance cognitive capacity. However, previous research on the picture superiority effect (Childers & Houston, 1984) points to the specific importance of visual appeals and indicates positive effects on comprehension (Cao et al., 2016), ethical (Coleman, 2006) or (sustainable) decision-making (Park et al., 2021, Magnier & Schoormans, 2015). Against this backdrop, including visual components in addition to textual information is beneficial (Lazard & Atkinson, 2015).

Taken together, the power of visuals to evoke emotional processes are an important element to consider in communication related to motivate sustainable consumption (e.g., Chapman et al., 2016; Rebich-Hespanha & Rice, 2016; Reisch & Bietz, 2011). Building on this research, many open questions remain regarding the role of emotions to address psychological determinants of sustainable consumption, such as through photographic material. This is relevant for the design of effective interventions. Thus, the present research contributes in this respect by examining the effects of emotion-evoking photographic material on selected psychological determinants. Namely, problem awareness as a central outcome in awareness campaigns is examined. Further, behavioral intention as an indicator more proximal to behavior is included.

1.3 Extending to the Field: Towards Evidence-Based Educational Interventions to Promote Sustainable Consumption

While Type I communication (Fischer et al., 2021) certainly has its merits to promote sustainable behavior change, research stresses the particular potential that capacity-building in education entails (Fischer et al., 2023; Sahakian & Seyfang, 2018). Based on Fischer et al.'s (2021) typology, this is referred to as type II communication, targeting consumers' engagement with topics of sustainable consumption and empowering them to consume more sustainably. In the political arena, the proclamation of the United Nations Decade of Education for Sustainable Development (United Nations Educational, Scientific and Cultural

Organization [UNESCO], 2005) has targeted sustainable consumption as part of a global educational agenda. In this context, the need of building specific "key competencies for sustainable consumption" (Fischer & Barth, 2014), has been pointed out. This includes the "competency to reflect on individual needs and cultural orientations", the "competency to plan, implement, and evaluate consumption-related activities" or the "competency to critically take on one's role as an active stakeholder in the market" (Fischer & Barth, 2014, p. 197). To promote a long-term change and maximize impact, addressing young people in education seems crucial (Thomaes et al., 2023; von Braun, 2017). Thus, the identification of effective educational interventions yielding long-term effects on sustainable consumption of children and youth is of particular importance (for reviews, see Ardoin et al., 2018; Rickinson, 2001; M. J. Stern et al., 2014).

However, more tailored interventions to strengthen sustainable consumption competencies are still lacking. Given the various psychological determinants of sustainable consumption behavior (see chapter 1.1), an integrative consideration of the individual in interventions is indicated, addressing problem awareness of sustainability issues, emotional, value-based and rational outcomes alike. However, the majority of existing interventions stems from environmental education programs and has predominantly addressed and found beneficial effects for knowledge-based outcomes such as declarative and action-related knowledge and problem awareness, as well as more rational factors such as attitudes or intentions (Álvarez-Suárez et al., 2013; Ardoin et al., 2018; for a meta-analysis, see van de Wetering et al., 2022). In this context, interventions based on goal setting and implementation intention (Oettingen & Gollwitzer, 2010) yielded promising results to strengthen the practical implementation of sustainable consumption behaviors (Bamberg, 2002).

In contrast, interventions targeting value-based or emotional aspects related to sustainable consumption, for example through more reflective units of underlying values or emotional involvement, remain scarce (van de Wetering et al., 2022). This is surprising given the circumstance that emotional processes have proven highly relevant for both sustainable consumption and learning processes. For example, evoking emotions could be an asset in intervention units to raise awareness (cf. chapter 1.2). Also, in line with a self-regulative function of self-conscious emotions (Onwezen et al., 2013), it is probable that inciting emotional involvement in training offers valuable opportunities for critical reflection processes, if adequate strategies of emotion regulation are provided (Ojala, 2013). Likewise, promoting sustainability values and value-based consumption in sustainability teaching has been proposed (e.g., Frank & Stanszus, 2019; Fuertes-Camacho et al., 2019). For example,

research suggests the effectiveness of educational interventions targeting preservation values or value of nature (Ardoin et al., 2018). Also, research on the importance of mindfulness for sustainable consumption suggests that mindfulness interventions yield beneficial effects for heightened awareness through disrupting routines or nurturing non-materialistic values (for a review, see Fischer et al., 2017).

While this body of research yields important insights, much is still to learn regarding an integrative consideration of knowledge-based, value-based, emotional, and rational psychological determinants as well as the particular relevance of evoking emotions in educational interventions. In their review, van Valkengoed and colleagues (2022) propose valuable points of departure on how to address key determinants of sustainable consumption through tailored informational, commitment or goal-setting elements in interventions. It has been suggested that addressing such elements in active and experiential training settings is favorable (M. J. Stern et al., 2014). This includes engaging learners in real-world environmental problems in various forms of social engagement or collaborative group work. Thus, the present research proposes an experiential training concept (Kolb, 1984) to empower young consumers in a type II communication (Fischer et al., 2021) intervention. It aims at contributing to existing gaps in research by critically reflecting adolescents' own experiences, including affective reactions, personal norms, or the perceived social or infrastructural barriers impeding behavior change.

To sum up, the present work adds to research and practice of promoting sustainable consumption in several ways. From a conceptual perspective, it focuses on the integration of knowledge-based, value-based, emotional, and rational determinants of sustainable consumption to explain and predict behavior in distinctive consumption areas. Further, the present research aims to consider external influences outside of the individual on the said internal psychological processes. Since emotional and value-based influences have been rather neglected in previous research, especially in the consideration of adequate intervention formats, these aspects are particularly acknowledged. Particularly, emotions hold an important activating function for facilitating processes of sustainable consumption. In this context, visual material is important as it is suited to evoke emotional reactions. Thus, the present research sheds light on the effects of different forms of emotions for sustainable consumption outcomes. Overall, this knowledge on both internal and external factors of relevance to behavior change lays the groundwork for promoting sustainable consumption behavior in effective interventions. Hence, from a practical perspective, the importance of emotion-evoking visuals as crucial element for type I sustainable consumption

communication (Fischer et al., 2021) is examined. Also, the present work contributes to our understanding of the successful design of type II communication (Fischer et al., 2021) by evaluating the long-term effects of a training intervention on sustainable consumption outcomes in different areas. Based on the previous insights, it particularly considers emotional processes. It seizes the potential of an experiential training setting including self-reflective sequences to benefit from emotional and value-based processes, among others, in sustainable consumption education. Specifically, it includes emotion-evoking visuals to impact psychological outcomes such as raising awareness, and considers strengthening self-regulative emotions as a training outcome. This contributes to developing and applying effective educational interventions based on psychological insights in the field. Against the backdrop of the integration of theoretical insights on the determinants of sustainable consumption, the three appended studies develop a practically relevant understanding of factors significant to the formation of sustainable consumption behavior and prove its value in a field application. This will serve researchers and practitioners alike to further develop and successfully apply evidence-based interventions for the promotion of sustainable consumption. In the following, the studies comprised in this work will be presented in more detail.

2. The Presented Research

2.1 Overview of the Presented Research

In line with the aforementioned reasoning, the present work contributes to the literature on the promotion of sustainable consumption in several ways. The studies in this research examine psychological influences on sustainable consumption behavior as both independent and dependent variables. Knowledge-based, value-based, emotional, and rational determinants are studied to explain sustainable consumption behavior and identify points of departure for behavior change (paper 1). Particularly, different emotional processes are considered across studies, as they are examined as internal antecedents of sustainable consumption behavior (paper 1), external influence in the form of emotion-evoking visuals (papers 2 and 3), and as an outcome in educational interventions (paper 3). Based on the previous theoretical integration, insights are considered for communication interventions. Evoking emotions through visuals is of high relevance for type I communication (Fischer et al., 2021), such as raising awareness or strengthening behavioral intentions to consume more sustainably in social marketing campaigns. Also, insights of the present research inform the development and evaluation of a type II communication (Fischer et al., 2021) intervention in

an educational setting (paper 3) with grade 11 youth, examining the effects of an experiential training intervention on the previously explicated psychological determinants. Given the relative negligence of emotional and value-based influences in previous educational interventions, particular attention is paid to these elements. For example, one unit includes the reflection of an emotion-evoking video sequence. Overall, insights from the present research offer an integrative psychological foundation for the development of effective intervention formats to strengthen sustainable consumption. Figure 1 summarizes the focus and interrelations of the appended studies.
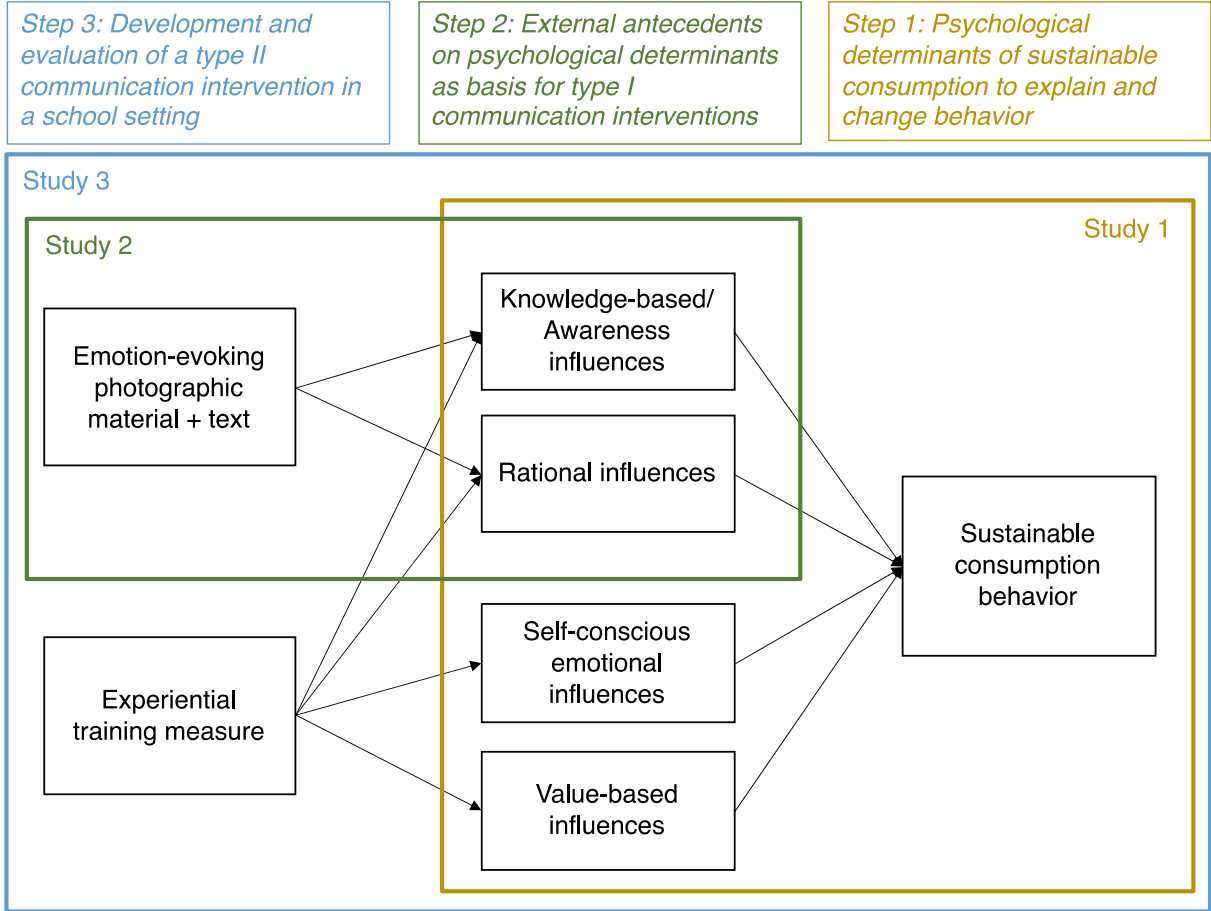

Figure 1. Summary of the studies included in the present research. Communication typology based on Fischer et al. (2021).

In view of the literature on different theoretical streams to predict sustainable behavior, **paper 1** examines the impact of four theoretical streams in their prediction of sustainable consumption behavior for three distinct product groups, namely, mobile phones, food and fashion. Specifically, based on the literature laid out in chapter 1.1, factors of knowledge and problem awareness, rational factors including attitudinal or social-normative

influences, emotional factors including self-conscious emotions such as feelings of pride or guilt, and value-based factors including personal-normative or responsibility influences are included in the prediction. The purpose of this paper is to examine the predictive value of the different theoretical frameworks. Also, the different research streams' incremental value over and above each other in their prediction of sustainable consumption is compared. This influence is systematically examined by iterating the order of inclusion in the prediction models, shedding light on the additional predictive value as well as on the conceptual overlap of different factors. This contributes to the literature in the following ways. First, it deepens our understanding of the different psychological influencing factors by relating them to each other, laying the basis for addressing individual sustainable consumption behavior in an integrative way. Second, by considering the consumption of mobile phones, it contributes to our understanding of consumption patterns in the information and communication technology domain – a fast-developing and globally highly relevant, yet in terms of individual consumption under-researched field. Third, it contributes to a more differentiated understanding of the specifics of consumption in different domains, namely, the food and the fashion domain in addition to mobile phones. These domains are characterized by a varying extent of product involvement as well as availability of sustainable consumption options, as evidenced by differences in the perceived risk of a purchase. Thus, identifying product-specific patterns adds to our ability to develop targeted and effective interventions.

With these psychological influences being established, **paper 2** turns our attention to the impact of influences outside of the individual on selected psychological outcomes. It investigates the impact of emotion-evoking photographic material on problem awareness related to the sustainability of and sustainable consumption intentions of mobile phones as exemplary product. In a pre-study, highly arousing photographic material evoking high levels of positive or negative emotions is selected. Based on the literature laid out in chapter 1.2 on emotional-motivational processes of photographic material as well as the negative asymmetry effect stating that individuals weigh negative information more strongly than positive information, in the main study, it is hypothesized that combining a text appeal with negative photographic material has a stronger effect than a text appeal with positive photographic material or text alone.[2] Moreover, it is examined whether the effect of photographic material on problem awareness and consumption intention is mediated by perceived credibility of the

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[2] The appended paper 2 included in this dissertation project was part of a larger data set that included additional dependent variables and different versions of text appeals. For the format of a short paper, a focus was chosen on the effects of photographic material on the selected outcomes of problem awareness and intention. Further information on the text appeals can be found in a respective conference contribution (Kempen et al., 2019).

information. Overall, paper 2 serves two distinct purposes. First, it addresses the sustainability of mobile phones as a relevant dimension for consumers' awareness and behavioral intentions. Targeting knowledge-based or awareness constructs seems particularly relevant in niche consumption areas with low awareness of the necessity of sustainable consumption. This is the case for the consumption of mobile phones, whose vast ecological and social sustainability challenges only gradually receive attention. Despite this, a current fixation on technical and a negligence of sustainability issues in the information and communication technology sector can be registered. Second, paper 2 offers experimental insights into the effects of emotion-evoking photographic material on the awareness of sustainability issues and sustainable consumption intentions. Disentangling mechanisms of emotion activation is an important step in understanding the role of emotions for sustainable consumption. It constitutes the basis for supporting people in sustainable behavioral tendencies, such as through social marketing or awareness campaigns. More specifically, the insights contribute to addressing current challenges in the mobile phone sector, such as the big distance between places where raw materials are extracted in the global south and unsustainable consumption patterns in the global north, and help designing effective awareness campaigns.

Against this backdrop, **paper 3** applies the acquired insights in the area of education for sustainable consumption. Based on the literature laid out in chapter 1.3, it develops and evaluates an experiential training intervention to strengthen competencies of sustainable consumption in grade 11 students of a comprehensive high school. Based on claims by M. J. Stern and colleagues (2014), this paper aimed to obtain a theoretically sound, effective training intervention to foster various psychological outcomes. For this purpose, a single training intervention with a duration of 5 school hours was designed. It encompasses three major sequences to target knowledge-based influences (specifically, problem awareness and specific knowledge about consumption alternatives), value-based and emotional influences (specifically, self-regulatory anticipated feelings of pride and guilt, and a sustainable personal norm) and rational influences (sustainable attitude, subjective norm, perceived behavioral control, and behavioral intentions). The sequences encompass various interactive methods aimed at working with and reflecting students' experiences. For example, based on insights on emotion-evoking visuals (chapter 1.2; paper 2), one sequence consists in an emotion-evoking video including a critical reflection of emotional reactions and feelings of responsibility. This contributes to the literature in at least three ways. First, paper 3 is based on an integrative consideration of the psychological determinants of sustainable consumption laid out in chapter 1.1. This strengthens the evidence-based consideration of psychological

insights in the educational field. Second, the study developed an educational intervention that consists in an interactive, experiential concept, including various media outlets, learning settings and methods. This enables much-needed processes of reflection particularly relevant for emotional and value-based processes currently not sufficiently researched in the field of education for sustainable consumption. Also, the interactive sequences promote the development of practical skills in three important consumption domains expected to be of crucial importance to the targeted age group, namely, the sustainable consumption of food and clothing, and the reduction of plastic use. Thus, the training intervention aims at contributing to a high transferability of learning content to everyday life. Third, the study adds to quantitative evaluation of long-term training effects on various psychological factors such as awareness, norms and behavior over time in a pretest /post-test /follow-up design.

2.2. Paper 1

Predicting sustainable consumption behavior: knowledge-based, value-based, emotional and rational influences on mobile phone, food and fashion consumption.

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Abstract

     Increasing sustainable consumption practices of individuals constitutes a crucial pillar of the global sustainable development strategy. Thus, the purpose of the present study was to examine psychological influences from different research streams and their incremental predictive value for sustainable consumption. In two studies, knowledge-based, value-based, emotional and rational factors were considered to predict sustainable consumption behavior of mobile phones, food and fashion.

Survey data were obtained from an online panel (Study 1: $N = 101$, Study 2: $N = 304$). Multiple regression results showed that value-based, emotional and rational factors contributed significantly to the prediction of sustainable consumption in both studies and all product groups. Problem awareness was a significant predictor only for food consumption. To improve the explained variance and detect different patterns of prediction, influencing factors were included into the prediction in varying order. Hierarchical regression results showed that a joint consideration of factors from different theoretical streams improved the prediction and that product-specific patterns emerged.

The findings support the need to jointly consider different influencing factors for the prediction of sustainable consumption. Understanding the drivers and obstacles of sustainable consumption constitutes the basis for educational measures or marketing interventions. The present study contributes to gaining product-specific knowledge which is pivotal for tailoring such measures to different consumption areas.

     Keywords: Sustainable mobile phone consumption; sustainable food consumption; sustainable fashion consumption; theory of planned behavior; value- belief-norm theory; self-conscious emotions; problem awareness

2.3 Paper 2

More than a thousand words? The effect of photographic material on problem awareness and behavioral intentions regarding the sustainable consumption of mobile phones.

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Abstract

The purpose of this paper was to investigate the effect of emotionally connotated photographic material on problem awareness regarding sustainability and sustainable behavioral intentions of mobile phones. In a prestudy ($N = 110$), photographs related to the ecological and social sustainability of smartphones were tested for their valence and arousal. Photographs with a high arousal level and either positive (positive condition) or negative (negative condition) valence were selected. In the main study ($N = 435$), these photographs were tested in a three-factorial experimental design. Each photo condition contained one pair of photographs depicting ecological and social sustainability. Results indicate that displaying negatively connotated photographic material leads to a higher awareness regarding the problems associated with smartphones compared to the display of positive photographs and a message only. However, no effect was found for the intention to consider sustainability in future purchase decisions or recycling intentions of mobile phones. The effect of the negative photographs on problem awareness was mediated by the credibility of the information presented. Based on the findings, limitations and practical implications are discussed. Specifically, understanding the effects of different types of photographical material on problem awareness can represent the basis for the successful design of marketing or information campaigns regarding the sustainability of mobile phones.

Keywords: Photographic material, Mobile phones, Emotions, Problem awareness, Sustainable purchase intentions

2.4 Paper 3

Strengthening sustainable consumption competence in high school students: Evaluation of an experiential training intervention.

Betzler, S.[1] & Kempen, R.[2] (under review). Strengthening sustainable consumption competence in high school students: Evaluation of an experiential training intervention. *Environmental Education Research.*

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Abstract

Designing effective educational measures constitutes a key area of action for achieving global sustainability goals. Therefore, the present study examined a training addressing sustainable consumption practices in plastic reduction, fashion and food. An interactive training was held in a German comprehensive school with grade 11 students, addressing psychological drivers of sustainable consumption behavior, namely, awareness and knowledge, emotional rational and value-based factors. The training was evaluated in a pretest(t1) /posttest(t2) /follow-up(t3) design. Final self-report data was obtained from 77 pupils in t1 and t2 and 56 pupils for all three points of measurement. Results of a repeated measures MANOVA indicate significantly higher levels of all outcome variables directly after the training. Significant long-term effects emerge on the knowledge of sustainable consumption alternatives, anticipated feelings of guilt, perceived norms in the individual's social environment, perceived control over one's own behavior, as well as sustainable consumption behavior in everyday life. Taken together, results suggest the training to be an effective instrument for furthering actual sustainable consumption practices of young pupils. Its implementation during school hours with regular-sized classes offers a low expenditure educational approach for sustainable consumption.

Keywords: education for sustainable consumption, sustainable consumption competence, psychological influences on consumption, experiential training, intervention study

3. General Discussion

The aim of the present work was to contribute to our understanding of and provide valuable insights into the promotion of sustainable consumption behavior in several ways. From a conceptual perspective, the presented research targeted a joint consideration of influences on sustainable consumption behavior both internal and external to the individual. Knowledge-based influences (specifically, problem awareness, and specific knowledge about consumption alternatives), value-based influences (specifically, awareness of consequences, ascription of responsibility, and personal norm), emotional influences (specifically, self-regulatory anticipated feelings of pride and guilt) and rational influences (specifically, attitude, subjective norm, perceived behavioral control, and behavioral intentions) were considered to represent the psychological complexity of sustainable consumption behavior (papers 1 and 3). This joint consideration further aimed at providing a more differentiated view of influences depending on different product contexts, namely, the consumption of mobile phones, food, and fashion consumption (paper 1). Based on the complexity of factors contributing to the sustainable consumption behavior and the underrepresentation of emotions in previous models explaining these behaviors, the present research sought to dive deeper into emotional processes by examining the effect of emotion-evoking photographic material (paper 2). Finally, the goal was to identify how sustainable consumption can be strengthened effectively through external factors, specifically through emotional picture material (paper 2) oftentimes used in social marketing awareness campaigns, as well as through educational training interventions (paper 3). From an applied perspective, evaluating the effectiveness of such intervention efforts is of utmost importance to identify adequate approaches to promote more sustainable consumption. This requires a multi-time perspective to define the long-term benefits of such interventions (paper 3). Taken together, the questions studied in this research stress the need to consider psychological determinants of sustainable consumption behavior in an integrative way and use them as guidance for evidence-based interventions.

3.1 Summary of Paper-Specific Results and Implications

One major concern in the sustainable consumption literature is to identify relevant influences that can be tackled to leverage more sustainable consumption behaviors. Thus, **the first appended paper** focused on psychological influences on the sustainable consumption of mobile phones, food, and fashion from different research streams. The products were selected to include varying degrees of availability of sustainable behavioral options and product involvement. In two studies based on samples of $N = 101$ and $N = 304$, the results indicate

that considered individually, value-based, emotional, and rational influences each contribute to the prediction of sustainable consumption in all product groups, while problem awareness contributes only to the prediction of sustainable food consumption. In terms of predictive power, value-based and rational factors explained the biggest portion of variance, followed by emotional factors. Across both studies, the strongest predictors were personal norm as value-based influence, anticipated feelings of guilt as emotional influence, and subjective norm and intention as rational influences.

To test for the research streams in an integrative way, exploratory stepwise regression analyses were conducted with iterated inclusion of the different research streams. This yielded an overall increase in explained variance compared to the inclusion of single theories. The overall explained variance differed depending on the product group, in study 2 ranging from 41% for mobile phones, 59% for fashion, and 67% for food. Results suggest that rational and value-based factors are key predictors, both explaining a substantial amount of variance in all product groups when added to the model first. When added after the other, each theoretical stream still contributed significantly beyond the other in almost all models and product groups, ranging between 0 and 12% of additionally explained variance. This indicates that both theoretical streams share a substantial amount of variance, but also explain distinctive facets. Also, both rational and value-based factors seem to contain emotional facets, as the significant contribution of emotions disappears when added to the model after the inclusion of value-based or rational factors. For the final step of inclusion, differences depending on the product group emerged regarding the strongest single predictors. For example, for mobile phones, subjective norm was especially important, while for food, problem awareness and personal norm emerged as relevant predictors.

From a research perspective, important implications can be derived from these results. First, across all consumption contexts, general tendencies suggest a joint consideration of factors across different theoretical streams to be beneficial. Selected rational (particularly intention and subjective norm) and value-based-factors (particularly personal norm), and negative anticipated emotions (guilt) should be targeted hand in hand in order to pay tribute to the complexity of human consumption decisions. Individually, emotional facets substantially contribute to the prediction of sustainable consumption. When considered jointly, they seem to stand back behind value-based or rational factors. This is an interesting finding, as emotions appear to serve an important mediating function. In a structural sense, this might point to a distal localization of emotional factors to final behavior. In line with previous structural research on sustainable consumption (for a meta-analysis, see Bamberg & Moeser,

2007), this might indicate that emotional influences are relevant in earlier stages of the behavior formation process, for example in facilitating behavior in line with norms (Onwezen et al., 2013), making them an ideal target for interventions.

Second, results indicate clear product-specific differences, such as the importance of problem awareness in the food sector, or the pronounced role of subjective norms for mobile phones, offering points of departure for targeted strategies in the promotion of sustainable consumption behavior. Looking at explained variance, a pattern of differences related to the availability and involvement of the product category emerges: The more variance the included predictors explained, the lower the assumed involvement of the product and the higher the assumed availability of sustainable behavioral options. Specifically, overall explained variance was highest for food products and lowest for mobiles phones. This is also reflected in descriptive results showing the same pattern for perceived behavioral control and sustainable consumption behavior, meaning that consumers thought it to be easiest to consume sustainably in the food domain and perceived the highest barriers to consume sustainably in the domain of mobiles phones. These tendencies suggest that other non-psychological factors not included in the previous model substantially contribute to the consumption decision, and they do so especially when availability of behavioral alternatives is low, pointing to the particular need of making sustainable consumption alternatives widely available and easily accessible. In terms of product involvement, the consumption decision of a high involvement product like a mobile phone might bear a comparatively high perceived risk for the consumer, as a consumption decision involves longer usage times and higher prices of the product. In this case, product-related factors such as brand, price, and product characteristics like technical features are then especially relevant and can constitute external barriers of sustainable consumption (Young et al., 2010). Further, these product-related factors can play an important role for achieving different underlying motives through consumption, such as expressing individuality or showing belongingness to one's social group (McNeill & Venter, 2019). For example, wearing certain (non-) sustainable fashion brands, owning a mobile phone with specific technical features, or going to a certain conventional or thrift shop might serve this purpose. Thus, satisfying motives can be achieved through various sustainable or non-sustainable acts of consumption relating to a variety of product-related factors.

From an applied perspective, knowing about the different influencing factors on sustainable consumption behavior is important for designing effective interventions for consumer behavior change or self-empowerment (type I and II communication, Fischer et al.,

2021), such as in marketing or education. Also, it underlines the necessity of tailoring interventions to the product group at hand. For example, problem awareness for sustainable food consumption could be strengthened through respective social marketing campaigns, or social-normative influences could be addressed in the case of mobile phones.

Building on these insights, it is of crucial importance for intervention design to identify external factors that have an effect on the explicated psychological determinants. So far, emotional processes are rather neglected in the debate, yet they seem to play an important role of activation in the formation process of sustainable consumption behavior. This might be a self-regulative activation, as indicated by the importance of self-conscious emotions in paper 1. Also, this might be a basic activation to create general motivation to act. In this context, as laid out in chaper 1.2, emotion-evoking visual characteristics and photographic material have been discussed, as they serve important emotional and motivational functions. Thus, **the second appended paper** aimed at providing insights into the effect of emotion-evoking photographic material displaying sustainability-related issues of mobile phone consumption on individuals' problem awareness and sustainable consumption intentions. This is of relevance because it directly informs us which elements interventions such as social marketing campaigns should include.

In a pre-study with a sample of $N = 110$, photographs depicting either positive or negative ecological and social sustainability aspects along the product life cycle of mobile phones were examined for their levels of valence, arousal, and selected emotions. Eight pictures showing a high positive or negative valence, high levels of arousal and high emotional profiles (sadness, guilt, consternation, disgust for the negative category and drive, joy, ease and pride for the positive category) were selected for use in the main study. Results of the main study with a sample of $N = 435$ indicate that a combination of negative photographic material and an accompanying text informing about sustainability-related issues along the product life cycle of mobile phones evokes higher problem awareness than a combination of positive photographic material and text or text alone, while controlling for previous knowledge and relevance of the subject.

From a research perspective, this indicates that the used emotion-evoking picture material does affect the participants' awareness of problematic states along the life cycle of mobile phones, making it an important element in the design of potential campaigns. In turn, no effect of the conditions was found on sustainable consumption intentions. Following the theoretical assumptions of the TPB that an individual's attitude, perception of control, and social norms are relevant predictors for intention, these factors might be more susceptible to

the photographic elements than intention itself. Further, as the first appended paper suggests that sustainable consumption practices of mobile phones can be considered as comparatively unavailable and high-involvement behavior, this supports previous research indicating that intentions are more easily changeable if the corresponding behavior is rather convenient and low-cost (Steg & Vlek, 2009).

From an applied perspective, targeting the motivational-emotional basis of behavior through photographic material evoking emotions seems like a valuable approach to raise awareness for sustainable consumption challenges in the mobile phone sector. In line with Rebich-Hespanha and Rice (2016) and Bradley and colleagues (2001), the results indicate that especially the use of high arousal negative photographic material is promising to draw attention and stimulate emotions, in turn affecting problem awareness. Thus, the validated material from the pre-study permits to target specific emotions in interventions like awareness campaigns. Also, in line with insights from the first appended paper, stressing available behavioral options to reduce perceived behavioral costs, such as informing about recycling options of mobile phones, could be an important addition to the design of campaigns on sustainable mobile phone consumption. Finally, since credibility of the photographs fully mediated the effect of negative picture material on problem awareness, particular importance should be given to the careful selection of respective material when designing campaigns. Overall, these insights contribute to successful type I communication measures (Fischer et al., 2021) and the effective design of respective interventions such as social marketing campaigns targeted at consumer behavior change.

Having identified relevant internal and external factors as points of departure for sustainable consumption interventions, it is of great interest to broaden the scope of application to strengthen type II communication (Fischer et al., 2021) targeted at change through capacity building by highly engaging consumers with sustainable consumption topics. Thus, **the third appended paper** adopted a longitudinal perspective on how a specific sustainable consumption intervention promotes respective sustainable consumption outcomes in the educational sector by following an experiential, self-reflective concept. Based on the theoretical integration in the first appended paper, the intervention conducted with six grade 11 classes of a comprehensive high school encompassed three units addressing knowledge-based, emotional and value-based, and rational outcomes related to sustainable consumption of food, fashion and plastic reduction. Its effectiveness was evaluated in a pretest /posttest /follow-up design, with a sample size of $N = 77$ /77 /56 students, respectively. Descriptive results indicate good training quality and good expected and retrospective training transfer to

everyday life, pointing towards the general soundness of the training intervention and the applicability in students' everyday life. Also, as pretest (t1) to posttest (t2) results indicate, all examined outcomes could be strengthened through the training. While yielding relevant insights for research on the evaluation of sustainable consumption interventions, this paper is of particular interest for the applied perspective. It is of great relevance to the identification and further implementation of successful training interventions that yield long-term effects under field conditions.

Thus, especially the evaluation results of the pretest (t1) to follow-up (t3) comparison deserve attention. Results on knowledge-based influences indicate that knowledge of consumption alternatives was significantly higher at the point of the follow-up compared to before the training intervention, possibly indicating that procedural knowledge about how specifically to consume sustainably could be successfully tackled. This constitutes an important and behaviorally-relevant prerequisite for sustainable consumption. However, problem awareness did not differ significantly between t1 and t3. Descriptive results show that problem awareness was comparatively high to begin with (t1), potentially suggesting a ceiling effect. This suggests that in the future, the introduction of self-based learning elements that are adaptable to the respective previous knowledge or awareness level might be a promising avenue.

Further, evaluation results on emotional and value-based influences indicate that anticipated feelings of guilt differed significantly in the comparison from t1 to t3. This supports previous research suggesting that inciting negative emotions in an educational training is relevant because negative emotions play a crucial role for critical reflection (Ojala, 2013). As is known from psychotherapeutic research, processes of change can be facilitated through emotional interventions (Greenberg & Safran, 1989). Thus, if embedded and reflected adequately, working with emotions can contribute substantially to achieving behavior change. However, anticipated feelings of pride were not significantly strengthened through the training. Further, evaluation results indicate that personal norm was not significantly strengthened through the training. Since value-based influences on sustainable consumption prove to be very stable (Thøgersen & Ölander, 2002) and the applied intervention can be considered as rather short, this might indicate a need for more comprehensive concepts including interventions with multiple sessions over a longer period of time. In this format, it seems promising to include more specific individual feedback elements on students' actual behavior to strengthen personal norms (Schultz, 1999). While the training intervention

included some methods of introspection and self-inquiry, this element could also be strengthened even further (Frank & Stanszus, 2019).

Also, evaluation results on rational influences indicate that subjective norm was significantly higher in t3 compared to t1. Thus, students rated the support of the social environment in favor of sustainable consumption to be significantly stronger. Since the intervention was administered in the classroom, it is conceivable that sustainable consumption tendencies were reinforced within this relevant social reference group. Also, intergenerational effects within households might have occurred (M. J. Stern et al., 2014), with students sharing learning outcomes with parents and thus, promoting sustainable tendencies at home. Also, the training evaluation showed significantly higher values of perceived behavioral control in t1 compared to t3. This potentially indicates that students could reduce perceived social or infrastructural barriers, and perceive themselves as effective change agents (Ramsey, 1993). This result is potentially connected to an increase in procedural knowledge: Students might know more and encounter less insecurities how to specifically behave more sustainably, making respective behaviors more feasible. In turn, attitude and intentions were not strengthened through the training. Thus, following van Valkengoed and colleagues (2022), providing stronger incentives for sustainable consumption might be a crucial additional element to consider in the future.

Finally, the three units included in the training intervention aimed at promoting sustainable consumption behavior of food, fashion, and plastic. Evaluation results comparing t1 and t3 indicate that the training intervention was generally successful in strengthening sustainable consumption behavior itself. Particularly, this provides more supportive evidence for findings from similar programs targeting practically-relevant behavioral learning (Barth et al., 2012; Boehme et al., 2018). Overall, based on the theoretical integration undertaken in the first appended paper, the results give valuable insights into which psychological influences can be targeted in an educational intervention and how it should be designed to promote more sustainable consumption tendencies related to different products relevant to a youth target group. Specifically, the three intervention units succeeded in strengthening knowledge-based, emotional and rational aspects and overall sustainable consumption behavior. This underpins results on the usefulness of the theoretical integration (paper 1), and stresses the feasibility of addressing different psychological facets in field interventions. Also, by employing emotion-evoking visuals (in this case, a video sequence) in the training units, the present research further explores the particular importance of activation of emotional processes in motivating sustainable consumption as suggested in the second appended paper.

3.2 General Implications for Research

Overall, the present work entails various implications of relevance for research and practice. From a theoretical perspective, the three studies included in this research emphasize the value of integrating different established theoretical approaches for the prediction of sustainable consumption behavior and their role as target variables to identify effective interventions. First, results indicate the consideration of psychological determinants from different theories jointly, heightening the prediction of sustainable consumption behavior. Though, a full consideration of all variables of the included theories does not seem useful, as it raises model complexity considerably, while only a moderate increase in overall explained variance can be registered. This suggests a conceptual overlap of constructs from different theoretical streams that measure and conceptualize similar aspects. Thus, it rather seems promising to integrate selected predictors from different theories and target them depending on the product context. As contrasting product groups shows (paper 1), different psychological influences seem dominant in different contexts. For example, social-normative influences seem to be particularly relevant for the consumption of mobile phones, while problem awareness is crucial for the consumption of food. In contrast, intention proves to be a relevant predictor for sustainable consumption behavior in all product groups. Based on these insights, more targeted strategies to promote sustainable consumption behavior are needed for different consumption contexts.

Second, knowledge-based factors are identified as an important basis for facilitating sustainable consumption, yet they do not seem to be directly behaviorally-relevant. Specifically, the present research shows problem awareness to be seldomly connected to sustainable consumption behavior directly, only yielding significant direct results in the food sector (paper 1). These results support previous studies locating problem awareness at the beginning of a chain of psychological behavioral antecedents (for a meta-analysis, see Bamberg & Moeser, 2007), with its indirect influence being mediated over other factors such as social norms or feelings of guilt. Thus, it is of great interest to identify external factors with a potential impact on problem awareness. Paper 2 revealed problem awareness to be susceptible to specific emotion-evoking external factors, making it an important target for type I communication strategies (Fischer et al., 2021) like awareness campaigns promoting sustainable consumption behavior. This is especially relevant for niche product groups that generally lack awareness for sustainability-related problems, such as the mobile phone sector. In contrast, results from paper 3 indicate that the training contents did not effectively heighten

problem awareness, but rather, seemed to target knowledge about specific behavioral alternatives. This implies that the training intervention does not unfold its main potential on raising awareness, but rather seems relevant for more behaviorally-relevant action-related knowledge. Overall, in line with previous research, different knowledge-based factors have been suggested to play a necessary, but not sufficient role in behavior change interventions, laying the grounds for other complimenting interventions to be effective (Bergquist et al., 2023).

Third, the present research suggests emotional processes to be meaningful for the promotion of sustainable consumption behavior. Specifically, results indicate anticipated feelings of guilt to be important in guiding sustainable consumption decisions (paper 1). When considered together, value-based and rational factors seem to contain emotional facets. This might indicate an earlier localization of the emotional construct in a structural logic (cf. Bamberg & Moeser, 2007), making emotions an important activating and mediating facilitator in the formation process of sustainable consumption. In line with results from study 1, relevant factors such as personal or social norms and intention are then linked to sustainable consumption behavior more directly. In this context, self-conscious emotions have been suggested to hold an important self-regulative function, aligning behavior with normative influences like personal norms (Onwezen et al., 2013). Broadening the scope of emotional influences, study 2 provides valuable insights into a potential appetitive motivational function to direct attention. Evoking negative as opposed to positive emotions through respective visual material (study 2) had a beneficial effect on raising problem awareness related to the production and consumption cycle of mobile phones. Thus, as an external influence, evoking negative emotions like disgust, sadness, consternation or guilt seem to be beneficial for raising awareness for problematic states in the world. Further, the present research provides valuable information on emotion profiles and arousal level of the examined photographic material, allowing to target emotions more specifically and adjust the level of arousal in future research. This is relevant because previous research indicates that highly arousing emotional content is very effective in attracting attention to problems, but does not necessarily motivate to act (O'Neill & Nicholson-Cole, 2009), thus affecting problem awareness and intention differently (study 2). Together, emotions seem to play a crucial role as both guiding attention to create problem awareness, as well as self-regulating via the anticipation of self-conscious emotions. Thus, in line with previous structural research, emotions might act as both antecedents and outcomes of problem awareness.

Fourth, the present research suggests value-based factors to be important predictors for sustainable consumption (study 1). Yet, study 3 did not successfully strengthen personal norms, and adequate educational approaches still remain scarce. Based on these insights, it might be beneficial to consider the connections of values and personal norms with underlying consumption motives. Existing research has stressed the various roles that consumption can play for identity-formation (Jackson, 2005; Warde, 1994). Consumers might be motivated by expressing their individuality, or by feeling belongingness to a group (McNeill & Venter, 2019). Depending on personal values and the relevant social context, this expression can take place via different sustainable or non-sustainable consumption acts, which are oftentimes (though not always) product-related. For example, consumers with a biospheric (i.e., sustainability-endorsing; Steg et al., 2014) value orientation and a strong sustainable personal norm might primarily shop in thrift clothing shops, or refrain from eating meat. In contrast, consumers with a strong hedonic value orientation (Steg et al., 2014) might purchase organic food for its tastiness (Schifferstein & Ophuis, 1998), while consumers with a strong focus on personal benefits (egoistic value orientation; Steg et al., 2014) might take sustainable consumption choices based on health benefits of organic food or clothing. All these sustainable consumption patterns relate to different product characteristics, but might satisfy the same needs for individuality or belongingness to a like-minded social group. The sustainability-motive-alignment hypothesis (Thomaes et al., 2023) assumes this convergence of the pursuit of personal motives for autonomy and status and sustainable behaviors as a central success factor in promoting sustainable consumption, especially in adolescents. Consequently, Thomaes and colleagues (2023) point to the importance of considering motive alignment in sustainability promoting policies for adolescents, such as educational programs. Future research should explore the interplay of psychological factors such as normative or value-driven determinants and consumption motives, as well as product-related factors. Also, it is of great interest to examine how situational factors can support more sustainable consumption in this process.

Fifth, in terms of rational influences, intention proved to be an important determinant of sustainable consumption behavior in all consumption contexts (paper 1). However, it could not be effectively targeted by the examined picture material (paper 2). This once more supports the structural logic suggesting that as a central predictor of behavior, intention is conceptualized at the end of a line of influences (Bamberg & Moeser, 2007), making it difficult to change through informational strategies (Steg & Vlek, 2009). While strengthening a sustainable attitude only played a minor role across studies, subjective norm and–to a lesser

extent–perceived behavioral control were meaningful predictors for sustainable consumption (paper 1) and could both be effectively targeted in the educational intervention (paper 3).

3.3 General Practical Implications

From an applied perspective, these insights need to be considered for intervention design in different consumption contexts, including the promotion of sustainable consumption in education, social marketing, or politics. Overall, based on the previous insights, it is generally desirable to develop and evaluate interventions which consider psychological determinants more broadly and go beyond knowledge, include emotional involvement, and target the reduction of infrastructural or social behavioral barriers. Product-specific knowledge on determinants offers a finer-grained picture of relevant points of departure to target interventions depending on the product context at hand.

Specifically, meaningful implications can be derived from insights on emotional processes. First, as paper 2 highlights, the use of photographic material can evoke different emotion profiles, directing attention to topics of relevance or creating awareness for problems. Evoking negative emotions like sadness, guilt, consternation or disgust are particularly suited to raise problem awareness. Further, the arousal level of the deployed pictures should be adjusted depending on the context, such as the goal or target group. This is relevant for the design of interventions aiming at creating awareness, like social marketing campaigns. For example, as evidenced from paper 2, an awareness campaign designed to draw attention to the problematic conditions in the mobile phone sector should include highly arousing negative emotional material. However, if the goal is to motivate more people to recycle their old mobile phones, this is not necessarily indicated, as a high negative emotional arousal might lead to inaction (O'Neill & Nicholson-Cole, 2009). Thus, an awareness campaign on recycling facilities of old mobile phones might require a lower arousal level or a more positive emotional profile of the included photographic material.

Second, based on paper 1, addressing self-conscious emotions is important to promote future sustainable consumption behavior. While involving students emotionally is contrary to much of the current alignment of educational interventions, focusing primarily on knowledge or attitudinal factors (Ardoin et al., 2018; van de Wetering et al., 2022), it should inform the design of educational interventions (study 3). However, it has to be noted that evoking emotional reactions in education cannot be a goal in itself. Rather, sequences involving students emotionally offer the possibility of reflecting on them adequately and thus, strengthening beneficial processes of behavioral adjustment. Thus, it is indispensable to

provide adequate emotion regulation strategies to reduce negative emotional states and promote action tendencies. Based on insights from paper 3, emotional imagery (in this case, video material) or other potentially emotion-evoking sequences such as the imagination exercise *dream journey* (cf. training sequence 2, paper 3; see also "Consumption detectives – an imagination exercise", Betzler et al., 2023) should be accompanied by appropriate reflection of the emotional experience. Also, targeting specific barriers, like strengthening perceptions of control by building action-knowledge about behavioral options and reflecting infrastructural or social barriers might have contributed to avoiding emotional paralysis and inaction.

Third, insights from paper 3 can help the further development of addressing values in interventions. While respective educational approaches are still lacking, given the relative stability of values (Thøgersen & Ölander, 2002), results of the present work indicate that a deeper and more extended reflection of the personal value basis of sustainable consumption over a longer period of time might be needed. Also, first evidence on the connection between mindfulness and sustainable consumption (Fischer et al., 2017) suggests mindfulness training to be a promising element for the promotion of non-materialistic values. In line with M. J. Stern and colleagues (2014), experiential learning settings focusing on the reflection and exchange of students' personal experiences and ideas constitute a promising format for an adequate reflection of both emotional experience and students' value basis. This is of relevance because previous research highlights the importance of biospheric (i.e., environmental) values for the effectiveness of informational interventions on sustainable behavior (Bolderdijk et al., 2013).

Fourth, against the backdrop of insights from paper 1, several rational factors proved important for the design of successful interventions. The third unit of the training intervention (paper 3) encompassed a sequence employing the goal-setting method WOOP (wish, outcome, obstacle, plan) based on mental contrasting with implementation intentions (Oettingen & Gollwitzer, 2010). While intention to consume sustainably could not be strengthened through the intervention, contradicting previous research on the effectiveness of implementation intention interventions (Bamberg, 2002), the sequence was supposedly effective in encouraging reflection on social or infrastructural barriers that could hinder the implementation of a plan. Moreover, the training intervention reflected on the social environment as a resource. Thus, the present research supports previous insights on the importance of the social context as well as the availability of sustainable consumption options (Piligrimiene et al., 2020). Besides its relevance for the development of educational measures,

these insights should inform politics on the great importance of reducing infrastructural barriers to sustainable consumption, and make respective consumption options cheaper, more diversified, and more easily accessible for bigger parts of the population.

Finally, based on insights across all three studies, the results of the present work support a growing body of research calling for a more integrative consideration of the psychological complexity underlying consumption. This includes questioning the importance that has traditionally been attributed to knowledge and rational factors as central determinants of behavior change. At the same time, it emphasizes the importance of emotional and value-based processes for effective intervention design. This indicates the urgency of a basic paradigm shift, moving away from the dominant image of the rational consumer, the *homo oeconomicus*, still prevalent in policy-making (Pollex, 2017). It calls for embracing emotional factors as an integral part of humans with important functions for guiding behavior in line with values.

3.4 General Limitations

As with all research, some limitations to the present work have to be noted. First, the present research considers different psychological factors. Across studies, the considered factors differ slightly, yet their general distinction into knowledge-based, value-based, emotional, and rational factors remains constant. While this categorization is grounded in an extensive body of research, it entails a certain degree of simplification that is prone to overlap, meaning that the grouped determinants are not necessarily completely selective. For example, it is conceivable that a value-based personal norm stemming from the VBN framework and a rational attitude stemming from the TPB to some extent do contain emotional facets, or that problem awareness as a knowledge-based facet has some overlap with a value-based awareness of consequences of one's own behavior. Thus, the categorization chosen in the present work should rather be seen as a general indication for the variety of behavioral influences to which the individual finds itself subjected. It is for future research to disentangle this conceptual overlap more thoroughly.

Second, two of the three studies included in this work constitute a cross-sectional design. In the future, a stronger focus on multi-time research is desirable. With the goal of evaluating the training measure, the third study followed a longitudinal design with one follow-up measurement on average approximately two months after the training. However, it has been suggested that change might need more time, especially for more persistent influencing factors, such as attitudes or values (Thøgersen & Ölander, 2002). Also, due to

time and organizational constraints in the field, it was not possible to assess a control group in the training evaluation study. This is problematic as influences such as external historical events or students' maturation pose a threat to validity that cannot be ruled out (Abrahamse, 2016). Thus, future research should develop longer intervention programs with multiple points of evaluation along the way, and implement more control group designs. In order not to deprive any student of the learning opportunity to participate in the training, a waiting list control group design seems appropriate in the educational context.

Third, all of the studies rely on self-report data. While this offers important advantages like ease of data collection and interpretation as well as its rich content (Paulhus & Vazire, 2007), it also yields disadvantages, like biases resulting from social desirability or people's need for consistency (Podsakoff & Organ, 1986). Thus, future research should include other sources of data assessment. For example, it could be beneficial to include expense volume for sustainable product purchases as an objective behavioral measure, or follow up on behavior more frequently and immediately via diary studies.

Fourth, while study 3 specifically addressed the application in the field, a more realistic and applied setting would have been desirable for paper 2, for example by designing and evaluating the effects of a social marketing awareness campaign containing picture material. This could potentially have positive effects for both ecological validity as well as effect size. Overall, this could contribute to finer-grained insights into the successful implementation of type I communication to promote sustainable consumption (Fischer et al., 2021).

Fifth, in the educational field, the conceptualization of sustainability or sustainable consumption competencies is contested, and so far, no consensus has been reached (Sahakian & Seyfang, 2018). The training intervention in the present research aims at strengthening different competencies based on Fischer and Barth (2014) and evaluates them indirectly through psychological factors. While this inclusion and quantitative evaluation of psychological aspects can be considered a useful addition to the educational literature, for future research, a more extensive theory-building and explicit evaluation of competence dimensions is desirable.

In sum, despite its limitations, the present research offers valuable contributions to the field by strengthening the integrative consideration of the individual with emotional, value-based, rational or awareness facets for sustainable consumption and seizing the potential of evoking emotions through visual material to raise problem awareness, as well as applying these practically meaningful insights in an educational intervention in the field.

3.5 Outlook

Based on the results of the described studies, several points of departure for future research can be identified. The present work offers valuable points of departure for model integration of knowledge-based, value-based, emotional, and rational influences to depict sustainable consumption in an integrative way. Unlike knowledge and rational influences, emotional and value-based processes have been somewhat neglected in the debate on how to promote sustainable consumption behavior effectively. The present work can inform future research in two important ways. Insights from paper 2 pave the way for more in-depth research on how certain emotion profiles of employed visual material can impact raising awareness in consumers. Insights from papers 1 and 3 indicate that self-conscious emotions, like anticipated feelings of pride and guilt, are relevant targets for interventions to strengthen sustainable consumption, potentially via other rational and value-based factors. In this context, it is of great interest to disentangle the underlying emotional processes. Particularly, future research should examine which motivational functions different emotions can serve in promoting sustainable consumption behavior, such as a general appetitive function relevant for directing attention, or a self-regulative function. In addition, recent research has found other emotions like climate-related anger to be important as motivational force for climate-relevant behavior (Gregersen et al., 2023). Future research should extend these insights to paint a more differentiated picture of our understanding of the emotional processes relevant for sustainable consumption. With recent calls to strengthen emotional competence in school curricula, especially in areas relating to the natural sciences or economics (Grund & Holst, 2023), these insights are of great relevance for the educational domain. Also, the role of emotions for policy support of sustainability policies is discussed (Gregersen et al., 2023). Thus, on a larger scale, the focus on emotional influences going beyond knowledge or rational influences contributes to a much-needed revision of the dominant conceptualization of a *rational consumer* that has been influential in policy-making for a long time (Jackson, 2005; Pollex, 2017).

While the differentiation of knowledge-based, value-based, emotional, and rational influences certainly is not exhaustive, it is already quite complex. Thus, for the sake of empirical validation, it cannot be the goal to propose a framework aspiring to depict psychological influences holistically. Rather, in view of the insights drawn from the presented papers, the present research encourages to consider these influences as a basis to extract factors with high predictive value relevant for a specific consumption context. Moreover, in

line with previous structural research (Bamberg & Moeser, 2007), the present work indicates that the different influences are not all equally proximal to sustainable consumption behavior, but rather, influence each other in complex ways. Thus, future research should focus on the importance of configurations of selected factors across different theories in a specific consumption domain or for a specific product, requiring a closer look at external factors of the consumption context (see Figure 2). Here, product-related factors such as brand, product involvement, or certain product characteristics play a crucial role for sustainable consumption. For example, for high involvement products, the importance of psychological determinants seems to generally decrease, supposedly making certain product characteristics like technical features more relevant. For food, taste or nutritional value of the food item are likely to be influential and potentially related to hedonic or egoistic value orientations. Also, certain product-related factors like brand or product design characteristics might serve motives like belongingness or expression of individuality. Examining the interplay of external product-related factors and internal psychological determinants for different product groups will allow for tailoring interventions more adequately in different stages of the behavior-formation process, thus accounting for different facets of the complex consumer.
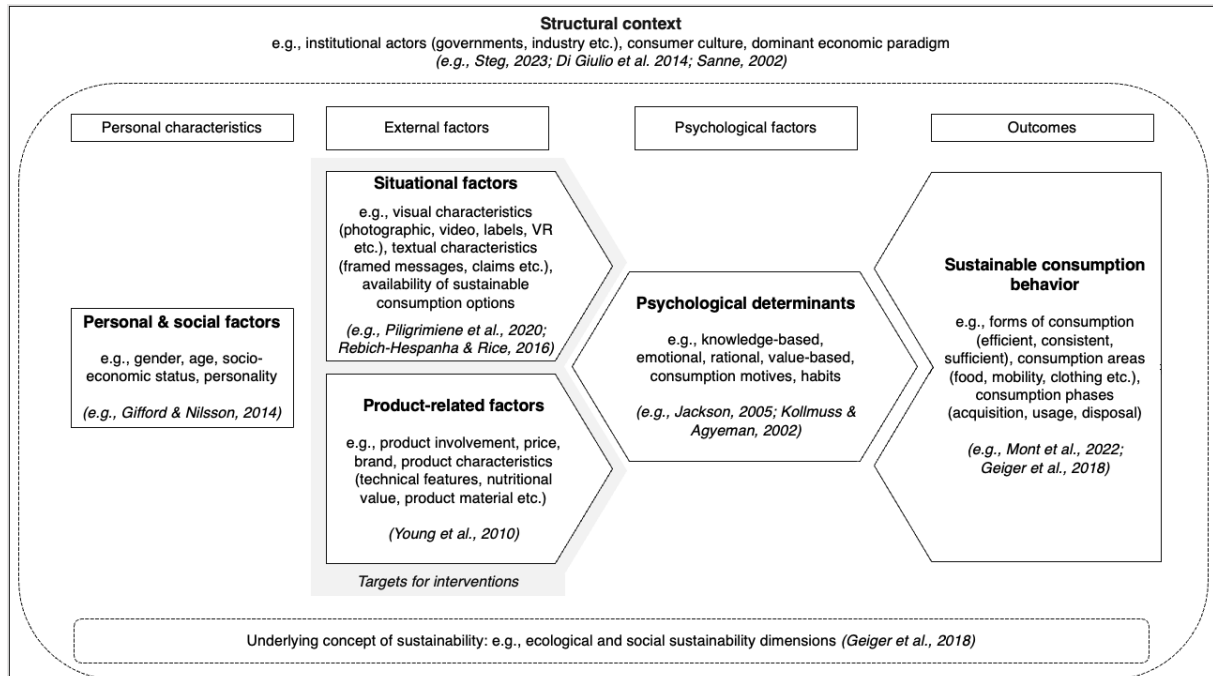

Figure 2. Conceptualization of the interplay of personal characteristics, external and psychological factors as points of departure for future research

Further, while the present research yields valuable first insights on how internal psychological determinants can be addressed by emotion-evoking visuals and written

messages as exemplary situational factors, further research is needed to examine external situational factors more extensively. First, there is a need to investigate the manifold importance of visual characteristics. For example, with the outstanding role that video material plays today, particularly on social media platforms, it is of great interest to investigate the effects that video sequences can have on sustainable consumption outcomes. In this context, experiential marketing interventions have found beneficial effects of video material on sustainable consumption outcomes through building relational proximity between producers and consumers (Weber et al., 2021). Also, research on how to communicate sustainable consumption via virtual reality experiences yields promising results on emotional outcomes, like compassion, or cognitive outcomes, like a better understanding of complex sustainability solutions (Muntean et al., 2020). Second, the importance of framing and tailoring textual messages in sustainable consumption communication has been emphasized (Kolandai-Matchett, 2009; Pelletier & Sharp, 2008). For example, verbal claims on product packaging (Magnier & Schoormans, 2015) or message framing strategies like gain or loss faming (Chang et al., 2015) showed effects on outcomes related to sustainable consumption. This knowledge about situational factors should then be considered jointly with external product-related factors as targets for interventions. This can inform policy-making on how to design large scale consumer awareness campaigns (Scholl et al., 2010), or contribute to effective design of product packaging, such as conveying information of the sustainability of a product, or creating proximity to the origin of or producers behind the product.

In this quest, the importance of personal and social factors for sustainable consumption behavior deserves some attention. Research has demonstrated the various influences of person-related characteristics such as gender, age, socio-economic status, or personality, and many more (Blankenberg & Alhusen, 2019; Gifford & Nilsson, 2014). Given the particular relevance of adolescents and young people for sustainable development (Thomaes et al., 2023; von Braun, 2017), the present work targets an educational intervention to this age group (paper 3). Future research should build on these insights and account for the various personal and social factors when tailoring interventions to specific target groups. This contributes to the improvement of intervention effectiveness.

On a methodological note, future research should concern itself with more rigorous and comprehensive evaluation efforts of interventions. First, insights from the present research on the emotional basis of photographic material yields valuable applications for the design of sustainable behavior change communications (type I communication, Fischer et al., 2021). Future research is needed to evaluate the effectiveness of awareness campaigns which

systematically integrate these communication elements. Longitudinal evaluation efforts should include a follow-up scheme to detect potential long-term effects on sustainable consumption and include relevant behavioral outcomes. Second, the present research yields valuable, yet tentative insights into long-term effects of an educational intervention for grade 11 youth following an experiential training concept (type II communication, Fischer et al., 2021). Recent meta-analytical research on environmental education interventions for children and youth indicated large effects of interventions on knowledge-based influences and small to medium effects on attitude, intentions, and behavior (van de Wetering et al., 2022). Value-based and emotional effects are rarely evaluated. Further, only 23% of studies assessed delayed effects with a follow-up measure and the majority of interventions evaluated a single group only (van de Wetering et al., 2022). These results point to a great need of evaluation research with a more rigorous methodological foundation. Specifically, evaluations should measure effects on more ample outcomes going beyond knowledge and behavior. Further, more extensive educational measures with accompanying longitudinal evaluations encompassing multiple points in time and considerable follow-up delays are desirable to identify long-term effects. Finally, despite the great challenges that this poses in actual educational settings, more (quasi-) experimental research designs are needed. Waiting control group designs offer great potential here, seizing the experimental benefits of the method while at the same time ensuring that every potential participant will receive the educational measure.

Additionally, the present work aims to encourage a broader conceptualization of *sustainable consumption* in future research. Referring to the first part of *sustainable* consumption, much of the theoretical foundation of sustainable consumption behavior stems from research on pro-environmental behavior in areas like water or electricity conservation or recycling (Abrahamse et al., 2005; J. L. Geiger et al., 2019). This entails a vast underrepresentation of the social facet of sustainable consumption in the current literature (Sesini et al., 2020). Likewise, the majority of existing intervention efforts is cognitive and knowledge-focused in nature and primarily addresses environmentally-relevant consumption outcomes (van de Wetering et al., 2022). At the same time, product-related consumption involves considerable challenges in terms of social sustainability, such as problematic working conditions in the sourcing of raw materials or the production of goods. Thus, the present research aimed at considering social and environmental aspects of sustainable consumption alike. Specifically, paper 2 contributed to a balanced depiction of social in addition to ecological challenges related to mobile phone consumption. Based on these

insights, further research is needed to take this conceptual stance and disentangle consumer perceptions of environmental and social dimensions more explicitly (Catlin et al., 2017).

Referring to the second part of sustainable *consumption*, it has been criticized that sustainable consumption has oftentimes been reduced to green consumerism (Akenji, 2014), focusing on the act of purchasing green products. Consequently, a scientific debate on a broader conceptualization of consumption and its implications for policy has emerged, increasingly questioning the dominant consumerist economic paradigm (Spangenberg & Lorek, 2019). This entails the importance of considering a broad range of consumption acts in different consumption phases from assessment over acquisition and use to disposal or recycling (Fischer et al., 2023). Besides merely increasing the efficiency or consistency of products, consumption reduction (sufficiency) constitutes a crucial strategy to accomplish the sustainability transition in a world with limited resources (Mont et al., 2022; Spangenberg & Lorek, 2019). Sufficient forms of consumption involve a critical reflection of needs in the assessment phase, alternative forms of acquiring products or an extension of product-related usage times. This also relates to a conscious examination of consumption habits, which have proven to be influential in shaping sustainable consumption (Bamberg et al., 2007; Carrus et al., 2008). Yet, empirical insights into the psychological basis of sufficient consumption behaviors still remain scarce. Thus, insights from the present work can inform future research in its quest to broaden the scope of conceptualizing sustainable consumption in various ways. First, it is of great interest to investigate the role of psychological determinants that are able to promote more sufficient consumption behaviors. Based on the insights from papers 1 and 2, this calls for more research on the identified knowledge-based, value-based, emotional, and rational processes with a specific focus on sufficiency outcomes. Second, sufficiency marketing has been proposed as a promising avenue to strengthen sufficient consumption patterns (Gossen et al., 2019). As the present research has included different aspects of the consumption life cycle and sufficient consumption alternatives such as extending the usage times of mobile phones (see papers 2 and 3), it can inform future research in terms of effective visual and textual communication elements. Third, future research should focus on sufficiency elements in educational interventions, like a critical reflection of consumption habits and needs, to strengthen sufficient consumption (for a collection of adequate tools in parts included in this work, see Fischer et al., 2023). Overall, this contributes to a more differentiated consideration of sustainable consumption outcomes, including different forms, areas and phases of consumption.

Finally, the promotion of individual sustainable consumption behavior has to be seen in the broader context in which consumption takes place, offering points of departure for more profound structural change (Steg, 2023). Consumers are in constant interaction with institutional actors, like companies offering a certain product palette, or politics seizing different regulative, informational or incentive instruments to streamline behavior (Loer, & Leipold, 2018). They dispose of various means of action, such as purchasing certain products and boycotting others, engaging in consumer activism or in other nonactivist public-sphere behaviors, like showing support or discontentment for policies in elections (Steg, 2023; P. C. Stern, 2000). In the process of defining what is accepted or rejected by consumers, the cultural concept of consumption, encompassing different underlying assumptions as well as manifestations in symbols or practices, is highly influential (Arnould & Thompson, 2005). The underlying economic paradigm, such as a focus on consumerism as part of an economic growth strategy, has a great impact. In view of limited available resources as well as the need to limit greenhouse gas emissions, resource-intensive consumerist lifestyles are being increasingly scrutinized. Managing this cultural change towards more sustainability requires substantial structural changes. Yet, like with all cultural processes, this change is not only a top-down process, but also entails bottom-up activity (Erez & Gati, 2004). This means that consumers are not only influenced by the dominant consumer culture, but are also continuously shaping it, individually and collectively. Against this backdrop, future research should focus on the complex processes of the structural context of sustainable consumption and acknowledge the various roles that consumers can assume within the system, leveraging consumers' impact as individuals and as part of collectives to promote a cultural change towards more sustainability.

As demonstrated, the present research can stimulate future studies in multiple ways. The interplay of personal characteristics, external situational and product-related factors and internal psychological determinants should be considered jointly to strengthen various sustainable consumption outcomes more precisely. This massive undertaking needs a critical reflection and further development of underlying conceptions of sustainability. Finally, psychological approaches can only be successful if they are situated in a broader structural context. Future research will hopefully build on the findings of the present work and continue to expand insights on the psychological basis underlying the effective promotion of sustainable consumption.

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