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Do online environments promote sufficiency or overconsumption? Online advertisement and social media effects on clothing, digital devices, and air travel consumption

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Abstract

Sustainable consumption is increasingly shaped by online environments. Everyday exposure to online advertisement and social media content by peers may influence individual consumption decisions. By representative online surveys (N = 2,694), we examined how perception of online environments influences individual consumption levels of clothing, digital devices and leisure air travel, mediated by individual aspiration levels, personal and social norms. Structural equation modeling confirms relationships between perceived consumption-promoting online content and consumption levels, fully mediated through aspiration levels. Sufficiency-promoting online content is associated with higher social and personal norms for sufficiency, but neither of the latter are linked to aspiration or consumption levels. These findings are consistent with the hypothesis that aspiration levels and consumption decisions are influenced by consumption-promoting online content. Due to the use of crosssectional data, it cannot be ruled out that these results reflect that more consumption-oriented individuals pay more attention to consumption-promoting online content. Hence, the dominant causal direction needs to be determined by experimental or longitudinal methods.

1 | INTRODUCTION

Consumption patterns, especially in the Global North, threaten planetary boundaries and human welfare (Steffen et al., 2015). In light of resource use levels exceeding critical planetary boundaries, negative environmental impacts, such as greenhouse gas emissions (IPCC, 2014), and natural resource extraction (IPBES, 2019) have to be reduced. An increasingly voiced strategy to secure people's need satisfaction within planetary boundaries is "sufficiency" in resource consumption, which is assumed to imply a decrease of consumption levels (O'Neill et al., 2018). Sufficiency entails the vision of a good quality of life for all without ever-increasing material consumption and with lower total resource consumption and waste (IPBES, 2019, pp. 9–10). Proponents of this vision argue that a reduction of resource consumption levels in industrialized countries is possible through the implementation of sufficiency goals and principles without negatively affecting social well-being or increasing social inequality.

Due to digitalization, the challenge to remain within planetary boundaries while meeting human needs is faced within a rapidly changing context. Worldwide, Internet users spend on average over 2.5 hr online daily, of which 2 hr on mobile Internet (Statista, 2020). Online environments increasingly penetrate most everyday activities, a trend that may pose both chances and risks for sustainable consumption (Börjesson Rivera et al., 2014). As daily exposure to online environments increases, they may affect sustainability-related consumption behavior in several ways. Exposure may facilitate (un) sustainable consumption, for example, as access to (online-) shopping improves (Bandura, 2002; Frick & Matthies, 2020; Midden et al., 2007). At the same time, online content may influence consumption motives by way, for example, of commercial advertisement (Dinner et al., 2014) or peer communication in social media (Bauer et al., 2012). As consumption levels, especially in the Global North, are far from a sufficiency-oriented lifestyle, research needs to examine determinants of unsustainably high consumption levels. There is a lack of systematic research on how and how much online content influences consumption motives, consumption aspirations and consumption levels. However, it has been argued that advertising, in general, boosts consumption through increased aspiration levels and consumption norms (Kasser & Kanner, 2004; Thøgersen, 2014; Uzzell & Räthzel, 2009), whereas sustainability marketing may evoke moral considerations promoting sufficiency (Gossen et al., 2019).

Therefore, sustainable consumption research needs to take the influence of Internet use into account (e.g., Chatzidakis & Mitussis, 2007; Reisch, 2001). Yet to our knowledge, the relationship between online content and individual consumption levels, including possible motivational mediators, still remains to be empirically investigated. The present study contributes to filling this gap by means of online surveys investigating the relationship between users' perception of online content and consumption levels with regard to three product categories that are increasingly advertised, traded and discussed online: clothing, digital devices and leisure air travel. In the following, key constructs are defined, followed by a review of extant research, based on which a theoretical model of the relationship between online content and consumption levels is proposed. Next, the methods are introduced, followed by a presentation and then a discussion of the results.

1.1 | Individual consumption and sufficiency—how much is enough?

While it is well established that global fossil energy and resource use levels need to drop guickly, it is less clear how this is translated into individual consumption behavior. Connecting the individual consumption of products and services to primary energy and resource use and greenhouse gas emissions is challenging. Researchers have suggested both a minimum and a maximum for a sustainable individual consumption levels (Di Giulio & Fuchs, 2014; O'Neill et al., 2018; Raworth, 2012; Spengler, 2016), the upper limit being defined by an equal distribution of limited resources within planetary boundaries and the lower limit by basic human needs. Di Giulio and Fuchs (2014) differentiate between objective needs and subjective wants based on Max-Neef et al.'s (1992) definition of basic needs as universal, finite in number and satiable. Need satisfaction varies culturally and individually, resulting in an infinite number of possible "need satisfiers." For example, if a person's aspiration for clothing possession is only determined by the need for protection of the body, then a smaller number of need satisfiers (clothes fulfilling objective needs) is probably aspired than if their aspiration level is also determined by the need for affection, identity and leisure (clothes fulfilling subjective wants). From this point of view, primarily the consumption of need satisfiers with high resource-intensity that are not indispensable for the fulfillment of objective needs should be curbed (Brown & Cameron, 2000; Di Giulio & Fuchs, 2014; Thøgersen, 2014). An individual consumption level that exceeds planetary boundaries has been defined as overconsumption (Brown & Cameron, 2000; Thøgersen, 2014), whereas sufficiency-oriented consumption has been defined as the voluntary restraint or reduction with regard to product and service purchase, including the choice of smaller dimensions of acquired products and services, and energy-saving use patterns (Jenny, 2016; Verfuerth et al., 2019). This reduction in product purchase often implies alternative consumption behavior, such as acquiring second-hand products, repair and sharing practices (Bocken & Short, 2016).

The second challenge of breaking planetary boundaries down to individual consumption levels is that the resource-intensity of consumption domains varies greatly (e.g., a holiday flight emits far more CO₂ than attending a gym class, also per monetary unit spent). Thus, environmental impacts of consumption rely not only on the overall consumption level, but also on the structure of consumption (e.g., Chitnis et al., 2014). Hence, in efforts to curb the environmental impacts of consumption, it is important to focus on goods and services that have a high resource- and greenhouse gas intensity (Dietz et al., 2009), such as cars or air travel (Lenzen et al., 2018; Røpke, 1999). It is also important to take into account that consumer goods and services in general are main drivers of the increasing energy and resource use in industrialized countries (e.g., embodied in household electronics: European Environment energy Agency, 2018: Lenzen et al., 2008).

Although on a macro-level, overconsumption and sufficiency are two sides of the same coin (namely, the consumption level), individuals' motives for consuming goods and services and motives for not consuming them are distinct (Ajzen & Sheikh, 2013; Richetin et al., 2012). Individuals' pro-environmental intentions are not always accompanied by a sustainable lifestyle (Moser & Kleinhückelkotten, 2017), as intentions and impact often diverge (Fischer et al., 2012). Whereas a voluntary sufficiency goal, like other types of pro-environmental behavior, is mostly predicted by moral motives such as personal norms (Schwartz, 1975; Stern, Dietz, Abel, Guagnano, & Kalof, 1999) or social norms for targeted behaviors (Ajzen, 1991), the consumption of products is typically explained by needs and wants (Thøgersen, 2014) or material aspiration levels (Karlsson et al., 2004). Social norms are also identified as a cause of material consumption, when material consumption functions as a status or group membership signal (consumption norms; Thøgersen, 2014; Aro & Wilska, 2014; Ajzen & Sheikh, 2013; Witt, 2001).

Sufficiency is an emerging research field in social sciences, including environmental psychology (where determinants of sustainable consumption have had a more central role than determinants of unsustainable consumption, for example; Thøgersen, 2014; Uzzell & Räthzel, 2009). As online environments are rendering increasing agency to individuals (Bandura, 2002), in terms of both influencing and fulfilling their material aspiration levels and finding ways to fulfil their needs with less material intensity, it is becoming imperative to study how the increasing use and perception of online content affects consumption aspirations and behavior.

1.2 | Online environments

The Internet is in many ways different from and more versatile than "traditional" media such as print, radio or TV. First, it increases information access, and as a marketplace it also gives access to purchase. Second, its inherent connectivity and networks allow peer-to-peer interaction for active participants co-creating the online environment, with online peer-to-peer interaction in online forums or social media potentially influencing attitudes toward (sustainable) consumption (e.g., Cooper et al., 2012). Third, the Internet also makes it possible to adapt online content presentation according to users' interests through personalization (Pariser, 2011). By blurring the lines between cause and effect of consumption actions, this adds challenges to research: Do individuals consume a product due to online advertisement, or was it advertised to them because of their past consumption patterns being traced online?

Research on the relationship between online exposure and consumption behavior is in an early phase. Lohmann (2015) found a positive correlation between Internet use and material aspiration levels. However, Wang and Hao (2018) found no relationship between Internet penetration and sustainable consumption indicators on a macro-level. Prior research distinguishes between two types of online content that may impact consumption motives and behavior (Reisch, 2001; Stephen, 2016): online advertisement and social media peer content, defined as the content users produce on social media (e.g., posts, likes, comments). The following two sections review research on these two types of content.

1.3 | Online advertisement

Regular exposure to traditional media is correlated with product sales (e.g., Rubinson, 2009) and material aspiration levels (Richins, 1987; Shrum et al., 2005). The reason for this relationship is often attributed to advertising exposure (Chia, 2010; Jiang & Chia, 2009; Thøgersen, 2014; Vandana & Lenka, 2014). At the macro level, advertisement spending is related to economic growth and increased consumption (Brulle & Young, 2007; Hoch et al., 2016; Molinari & Turino, 2018). Expenditures on online advertisement are growing steadily, with a current growth rate of 8% per year in Germany (PwC, 2018). For example, not only online sales but also over-thecounter retail sales of clothing are positively linked to online advertisement expenditures, with larger returns than traditional advertising (Dinner et al., 2014). One reason is personalization: banner ads personalized by retargeting (advertising products or shops people recently visited online) receive more clicks than non-personalized banner ads (Bleier & Eisenbeiss, 2015). It has also been proposed that online-advertisement can foster sufficiency-oriented consumption, when it avoids aggressive marketing strategies and especially, when it promotes consumer sufficiency (e.g., promoting the reduction of new product purchase, Bocken & Short, 2016; Gossen et al., 2019). Therefore, depending on advertisement content, it can arguably foster either increased consumption or sufficiency.

1.4 | Social media peer content

Perceiving social media peer content may influence individual consumption levels in the same way as perceiving online advertising. Social media use was found to be positively related to materialism and purchase intentions (Kamal et al., 2013). Also, survey respondents reported they had an increased desire to buy clothes after browsing fashion blogs or seeing social media posts (Wahnbaeck & Roloff, 2017). In another study, an experimental manipulation of social media peer content increased purchase intentions for sportswear (Seng & Keat, 2014). Apart from such increases in aspiration levels (Kasser & Kanner, 2004), social media peer content is also assumed to change behavior through social influence (Goldsmith & Goldsmith, 2011). Taylor and Strutton (2016) found that Facebook use predicts conspicuous consumption, mediated by emotions such as envy, narcissism and self-expression. Another study found that experimentally manipulated social information about peers' consumption led to increased consumption levels (Carbone & Duffy, 2014). Accordingly, the approval of products on social media (giving "likes") has been found to increase their purchase (Lee et al., 2015), and so has joining brand communities on social media (Goh et al., 2013). But social media can also positively influence environmental behavior: For example, information shared on social media has been found to increase individual voting behavior through social norms (Bond et al., 2012). Oakley and Salam (2014) found a positive relationship between receiving Facebook posts about energy-saving and environmental responsibility and Foster et al. (2010) found that social comparison on Facebook can lead to reduced energy use.

1.5 | A model of exposure to online content and consumption levels

Summing up the state of research, various links appear to exist between online advertisement, social media peer content and consumption levels. Yet, there is little empirical research aiming at understanding this relationship at the individual level, including which motivation factors mediate the relationship. Also, theoretical approaches to online content's influence on consumption levels are sparse. Therefore, the theoretical framework of this study builds on several theoretical models. The basic foundation is environmental psychology behavior models (e.g., Ajzen & Sheikh, 2013; Klöckner & Blöbaum, 2010; Steg & Vlek, 2009; Stern, 2000). These models include normative motives such as personal and social norms, yet they do not make clear predictions on online content's influence on behavior, simply categorizing online content as "contextual factors" (Steg & Vlek, 2009; Stern, 2000). Media effects are examined in more detail in marketing research (e.g., Taylor & Strutton, 2016), which has identified materialism and aspiration levels as relevant mediators. Hence, despite environmental psychology models lacking these potential determinants of unsustainable overconsumption (Osbaldiston & Schott, 2012; Uzzell & Räthzel, 2009), aspiration levels (Thøgersen, 2014) are added to our theoretical framework. As a step

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toward integrating these approaches, our theoretical framework, outlined in Figure 1, suggests a causal relationship of exposure to online content (the time spent online) and perception of online content with the consumption level of various products, which is at least partly mediated through the motivational constructs social norm for sufficiency, social norm for consumption, personal norm for sufficiency and the aspiration level.

Due to the moral character of sufficiency, we hypothesize that a personal norm of sufficiency influences consumption levels (Norm-Activation Model; Schwartz, 1977; Schwartz & Howard, 1981; Value-Belief-Norm Theory, Stern et al., 1999). We further predict an influence of multiple and contrarian social norms, some promoting higher consumption levels, others promoting constraint (i.e., norms for sufficiency). These two types of social norm effects are inspired by Ajzen and Sheikh (2013), who included both intentions for and against a behavior in a two-sided theory of planned behavior. Especially for products consumed in public, such as clothing, many digital devices, and travels, social influence plays a major role for individual choices, which we assume can be direct, but also indirect, mediated through personal norms (Cialdini et al., 1991; Klöckner & Blöbaum, 2010). The proposed determinants of overconsumption are operationalized as aspiration levels (e.g., Karlsson et al., 2004).

The assumed effect hierarchy of the model is based on the following rationale. Contextual factors, such as online environments (e.g., social media peer content, advertisement), can work as cues or primes and thus, activate values or motives that influence behavior (Thøgersen & Alfinito, 2020; Verplanken & Holland, 2002). Experiments have found that advertisement-like cues can prime selfenhancing motives as consumerism, and that advertisement cuing self-transcendent values can increase pro-social behavior (Bauer et al., 2012; Defever et al., 2011). Similarly, Ballew et al. (2015) argue that the exchange with peers on social media influences psychological factors (e.g., personal norms, social norms or status) which can foster pro-environmental behavior. Based on these findings, we hypothesize that exposure to online content can increase the situational salience of moral, hedonic or gain motives (e.g., attitudes, values, norms, aspirations; Steg & Vlek, 2009), reinforcing the long-term strength of these motives. These altered or reinforced motives may affect individual consumption levels.

Consequentially, consumption-promoting online content may boost new product purchase, whereas sufficiency-promoting content may foster restraint and sufficiency-oriented consumption behavior. Priming moral motives have been found to inhibit self-enhancing motives and vice versa (Maio et al., 2009). Therefore, we expect sufficiency-promoting content to reinforce sufficiency-oriented motives and inhibit consumption-oriented motives, and vice versa. Since we are aware of only one study on how time spent online is related to consumption levels (Lohmann, 2015), we control for all possible direct effects of antecedent variables on behavior, according to our theoretically assumed effect hierarchy, in addition to the theoretically predicted mediation paths.

Taking a transactional perspective, individuals and their environment are linked in complex and reciprocal ways (Altman & Rogoff, 1987; Uzzell & Räthzel, 2009). Hence, the non-recursive model in Figure 1 is a simplification, reflecting theoretical assumptions about the main direction of influence. As mentioned earlier, we acknowledge that a mutual and dynamic relationship between content perception and consumption level is likely (similar to Thøgersen & Ölander, 2006), as for example searching for goods online may result in increased as well as in personalized advertisement individuals are exposed to. However, our empirical study is based on cross-sectional surveys, which means that we are not able to test assumptions about causal directions. This study is only a first step toward obtaining a better understanding of individuals' interaction with online environments.



FIGURE 1 Model of the relationship between exposure to online content and consumption level

2 | METHOD

The proposed model was tested with online-surveys in the consumption domains of clothing, digital devices and leisure travel. The three domains were chosen based on the criteria of environmental impact (for digital devices, see Arushanyan et al., 2014; for clothing, see Choudhury, 2014; for air travel, see Lenzen et al., 2018) and the prevalence of online advertisement (clothing and electronics; Statista, 2019b) and social media peer content (e.g., traveling in social media peer content; Statista, 2019a).

2.1 | Design and procedure

We conducted representative cross-sectional online surveys for each of the three domains. Each survey first asked about the amount of products bought in a specific time period, then aspiration levels, time spent online, perception of product-related online advertisement and social media peer information on product consumption. The perception of shopping online as well as social and personal norm about respective products (clothing, digital devices and travels) were also measured, along with additional measures used for other study purposes. All items that might prime for sufficiency or sustainability were placed toward the end of the survey to reduce the risk of socially desirable answers and biases. Environmental concern and sociodemographic variables were measured last.

2.2 | Sample

The initial sample sizes were: clothing $N_{\rm C}$ = 1,224, digital devices $N_{\rm D}$ = 1,233, and leisure air travel $N_{\rm T}$ = 1,348. To control the response quality (Meade & Craig, 2012), an instructed response item lead to the exclusion of $N_{\rm C}$ = 157, $N_{\rm D}$ = 156, and $N_{\rm T}$ = 269 participants. Participants with too short response times were also excluded ($N_{\rm C}$ = 111, 170 items; less than 340 s; $N_{\rm D}$ = 105, 195 items; less than 380 s; $N_{\rm T}$ = 98, 190 items; less than 380 s), applying a minimum of 2 s of processing time per item (Huang et al., 2012). Lastly, participants

reporting the acquisition of a higher number of sustainable products than products in total were also excluded ($N_{\rm C}$ = 73; $N_{\rm D}$ = 112, and $N_{\rm T}$ = 5). The final samples are presented in Table 1.

2.3 | Measures

All measures described in the following section, except for the time spent online and socio-demographic data, were assessed specifically related to the consumption domain of the survey, that is, clothing, digital devices, or leisure air travel. The complete lists of items can be found in Tables A1, A2, and A3 in Appendix A. The reliability of latent constructs (Table 2) was estimated as Composite Reliability (CR; Raykov, 2004) and average variance extracted (AVE).

Consumption levels for new clothing, new digital devices and leisure air travels were measured both as amount of products purchased and monetary expenditures in a specified time period. These two measures served as indicators for the latent factor of consumption level. For the amount of clothing purchased, participants reported the number of new pieces of clothing ("new" meaning, not second-hand) acquired in the last 3 months and for digital devices, the number of new devices from a checklist of 14 devices purchased in the last 2 years. Leisure air travel was measured as the number of return flights taken in the last year, assessing both short-distance (<3.5 hr, after Mensen, 2013) and long-distance flights (>3.5 hr). In the confirmatory factor analyses (CFA) and structural equation model (SEM) analyses, the sum of flights was weighed, with long-distance flights being double-weighted. In each consumption domain, the expenditure for the respective product category was measured as the amount of money they spent on it in Euros per year, in intervals (clothing: 0-100, 101-200, [...], more than 2000 €; digital devices: 0-100, 101-200, [...], more than 1,500 €.; leisure travel: 0-200, 201-400, [...], more than 3,000 €).

The personal norm for sufficiency was assessed with two items on a 7-point Likert scale with the option of choosing "I don't know", which was categorized as missing data, for example, "Due to values that are important to me, I feel obliged to keep my clothing consumption low." In the case of air travel, the measure included four items.

TABLE 1 Sample and comparison to German population

	Clothing N = 883	Digital devices N = 860	Travel <i>N</i> = 976	Group comparison	German population (Destatis, 2018)
Age M (SD)	46.0 (14.0)	46.6 (14.4)	46.1 (14.1)	F(2) = 0.31 p = .73	44.3
Education level	24% primary 37% second 38% tertiary 1% other	23% primary 37% second 38% tertiary 2% other	23% primary 37% second 39% tertiary 1% other	χ^2 (8) = 13.79 p = .09	30.4% primary 23.1% second 31.9% tertiary
Income (€, <i>Median</i>)	1′500-2′000	1′500-2′000	2′000-2′500	F(2) = 4.84 p < .01	1′957 € (in 2013)
Gender	51% female 48% male 1% other	51% female 48% male 1% other	51% female 48% male 1% other	$\chi^2(2) = 0.01$ p > .99	50.7% female 49,3% male

Note: For group comparison of gender and education level, Chi square tests were used. For age and income, we used one-factor ANOVA.

	Clothin	g		Digital	devices		Leisure	air travel	
	N	М	SD	N	М	SD	N	М	SD
Outcome variables: Consumption level	In the la	ast 3 months		In the l	ast 2 years		In the la	st year	
Number of products purchased		3.92	2.99		2.77	2.41		1.22	2.01
Expenditure ^a	849	151	185	823	370	381	907	707	925
Mediators: Psychological motives									
Personal norm for sufficiency ^b	840	3.50	1.85	811	4.30	1.91	902	2.99	1.83
Social norm for sufficiency ^b	740	4.10	1.45	733	4.73	1.40	846	3.58	1.50
Social norm for consumption ^b	770	4.25	1.43	741	4.08	1.51	872	4.64	1.44
Subjectively sufficient level of consumption		10.05	9.22		2.72 ^c	2.11		2.37	2.34
Subjectively ideal level of consumption		19.31	12.76		6.20 ^c	4.04		6.25	4.03
Predictors: Online content									
Consumption-promoting content ^d		1.48	1.44		1.46	1.29		1.41	1,27
Online advertisement		1.94	1.53		1.85	1.46		1.61	1.37
At least one perception			94.0%			86.2%			79.6%
Social media peer content		1.09	1.44		1.08	1.36		1.32	1.41
At least one perception			53.2%			56.3%			66.5%
Sufficiency-promoting content ^d		0.52	0.96		0.72	1.06		0.54	0.88
Online advertisement		0.57	0.99		0.71	1.12		0.59	0.93
At least one perception		38.8%				44.9%			43.2%
Social media peer content		0.64	1.07		0.74	1.16		0.50	0.94
At least one perception		39.4%			42.1%		34.3%		
Time spent online ^e		4.94	2.39		4.78	2.27		4.82	2.31

Note: N, Number of participants who answered; full sample if left blank: $N_{\text{Clothing}} = 886$; $N_{\text{Devices}} = 860$; $N_{\text{Travel}} = 976$. ^aIn Euro.

^bRange: 1 = not at all; 4 = indifferent; 7 = absolutely agree.

^cNumber of digital devices individuals want to own at least (ownership instead of purchase);

^dRange: 0 = never, 1 = several times a year, 2 = monthly, 3 = weekly, 4 = several times a week, 5 = daily, 6 = several times a day.

^eRange: 0 = 0 hr, 1 = up to 1 hr, 2 = between 1 and 2 hr, 3 = between 2 and 3 hr, [...], 12 = more than 11 hr.

The social norm for sufficiency was measured by three items including injunctive and descriptive norms regarding "people who are important to you, e.g., friends, partner, family members and other people in your direct surroundings". For example, "People who are important to me try to buy less of the product", measured on a 7-point Likert scale, with a "do not know" option.

The social norm for consumption was also measured with a Likert scale corresponding to the social norm for sufficiency, including three items, for example, "People who are important to me approve of me buying new digital devices regularly."

The aspiration level in each consumption domain was measured by two items. (1) The subjectively sufficient level of consumption, representing the minimum consumption level individuals deemed necessary for a good life (Aro & Wilska, 2014; Jenny, 2016; Karlsson et al., 2004), was measured with an instrument developed by Jenny (2016): "How many pieces of clothing would you need to purchase as a minimum / which digital devices would you need to own as a minimum / how many air travels would you have to go on as a minimum per year, so that your personal well-being is not restricted?". For digital devices, this was assessed by ticking the list of 14 digital devices used in the measurement of products purchased. In addition to the number of products or services, the answer options included: "I would rather not purchase any at all" and "clothing / digital devices / air travels are not relevant to my well-being", which were coded as zero. (2) The subjectively ideal level of consumption the respondent is striving for ("levels of consumption at which no substantial further improvement in well-being is to be expected", Di Giulio & Fuchs, 2014, p. 188) was measured by items adapted from a "want" or "desire" concept (Campbell, 1998). It assessed "how many pieces of clothing / digital devices / how many travels would you ideally like to purchase within a year, if money and time were no issue?" The ideal level of device consumption was again assessed by ticking the check-list of 14 digital devices.

Perceptions of product-related, sufficiency-promoting and consumption-promoting online advertisement and social media peer content were measured by items capturing the self-reported

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Proceed 2 Commutatory factor analysis model. *Note:* Clothing survey—Model nt: χ^2 (N = 863, *d*) = 156) = 467.4, *p* < .001; RMSEA = 0.052; 90% CI = [0.047, 0.057]; CFI = 0.953, TLI = 0.937; SRMR = 0.042. Digital devices survey—Model fit: χ^2 (N = 860, *df* = 159) = 476.1, *p* < .001; RMSEA = 0.051; 90% CI = [0.046, 0.056]; CFI = 0.956, TLI = 0.942; SRMR = 0.038. The factor loadings of the two personal norm items were set to be equal to solve a Heywood case (following Chen et al., 2001). Leisure air travel survey—Model fit: χ^2 (N = 976, *df* = 237) = 624.2, *p* < .001; RMSEA = 0.044; 90% CI = [.039, .048]; CFI = .964, TLI = .955; SRMR = .038. The items in dashed boxes were only measured in the leisure air travel survey (sc3, sc4, pn3, and pn4). In the leisure air travel survey, aspiration level was separated in two latent factors: sufficient and ideal level of consumption. Model specification—Four error terms were allowed to correlate within the factor "consumption-promoting content perception" due to common unique content that was not shared with all measures (snc1-snc2: 0.45, 0.55, 0.40; snc1-snc3: 0.25, 0.24, 0.18; snc2-snc3: 0.21, 0.28, 0.17; error terms of items measuring advertisement perceptions; snc3 – snc4: 0.21, 0.28, 0.11; error terms measuring "social media" perceptions). In addition, the error terms of the two items measuring sufficiency-oriented advertisement perception were correlated (0.33) in the leisure air travel model. For correlations between factors, see Table 3. For factor loadings, see Tables A1-A3 in the Appendix A

frequency of seeing the respective online content on a 7-point scale from 0 (never) to 6 (several times a day). In each survey, one item measured sufficiency-promoting advertisement for the respective products, and one item sufficiency-promoting social media peer content (the travels survey included two items each). Perceptions of consumption-promoting online advertisement and social media peer content were each measured with three items, for example, "I see holiday pictures and posts of my friends on social media." Social media peer content items were only presented to participants who in a prior question stated they use social media; else they were coded as zero. As these items were constructed for this study, the structures of social media peer content and online advertisement perceptions were analyzed with exploratory factor analysis (Appendix B, Tables B1, B2, and B3), which revealed a two-factor-structure: perception of consumptionpromoting online content and perception of sufficiency-promoting online content.

The time spent online was assessed to measure the exposure to online environments. This was calculated from self-reported daily hours of Internet usage as a sum of the "number of hours that you actively spend online for private purposes (not that your internet is turned on)" on fixed and mobile devices, each measured in hour intervals (0 = 0 hr, 1 = up to 1 hr, 2 = more than 1, up to 2 hr [...], 6 = more than 6 hr).

The questionnaire further assessed the sociodemographic data age, education level, income level and gender.

2.4 | Statistical analysis

In each consumption domain, our analysis followed the two-step procedure suggested by McDonald and Ho (2002). We first fitted a CFA model to the data and analyzed correlations between latent variables. Next, we tested the hypothesized model by means of SEM. The analyses were done with the lavaan package of R. Due to skewed distribution of some variables, we used robust maximum likelihood (MLR) with Yuan-Bentler Correction and Huber-White estimation of standard errors (Rhemtulla et al., 2012; Steinmetz, 2015). To handle \perp Wiley-

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missing data, we used full information maximum likelihood (FIML, Graham, 2009; Steinmetz, 2015).

The same measurement model and structural model were assumed in the three consumption domains, meaning that the three domains served as cross-validation studies for the hypothesized model. We started with the standard assumptions of a simple structure factor pattern and uncorrelated error terms. However, it appeared that four measurement error term correlations within the latent factor "consumption-promoting online content" were highly significant in all three models. Since these error correlations could be attributed to differences in measurement within the same latent factor, they were allowed (Bagozzi & Yi, 2012). In the factor "sufficiencypromoting online content" of the leisure air travel model, two error terms were allowed to correlate for the same reason (see Figure 2).

Time spent online, as well as the sufficient and ideal level of consumption in the leisure air travel model were assessed by single items. For these factors, error variance could not be estimated and was therefore fixed to 10% of the indicator variance (as suggested by Steinmetz, 2015, p. 102). Finally, in the digital devices models, the loadings of the two variables measuring personal norm for sufficiency were fixed to be equal, to avoid a Heywood case (Chen et al., 2001, p. 504).

3 | RESULTS

Table 2 reports descriptive measures of the included predictors, mediators and the outcome variable for each of the consumption domain samples. Psychological motives differ between the domains. The personal norm for sufficiency is overall rather low, but highest for digital devices, lower for clothing consumption, and lowest in the leisure air travel domain (Bonferroni-corrected contrasts F(2) = 105.9, p < .01). Social norms for sufficiency follow the same pattern (F(2) = 121.9, p < .01), but are stronger.

Social norms for consumption are higher than the scale midpoint in the clothing and air travel domains, suggesting a perceived social pressure to consume. The social norm for sufficiency is higher than the social norm for consumption in the domain of digital devices, t(722) = 8.03, p < .01, whereas no difference is found in the clothing domain, t (735) = -1.69, p = .09, and the inverse relationship for leisure air travel, where the social norm to travel is stronger than the social norm to travel less, t(836) = -14.48, p < .01. Social norms overall show missing value rates between 11% (social norm for air travel consumption) and 16% (social norm for clothing sufficiency), suggesting that some have not thought about social expectations in these domains. Turning to aspiration levels, the subjectively sufficient level of consumption was lower than the ideal level in all domains, for clothing t(885) = 26.22, p < .01, digital devices, t(859) = 28.62, p < .01, and air travel, t(975) = 30.84, p < .01. The perception of online content was generally low, and consumptionpromoting online content was perceived more often than sufficiencypromoting digital contents in the domains of clothing, t(882) = 22.22, p < .01, digital devices, t(859) = 21.63, p < .01, and leisure air travel, t (975) = 23.97, p < .01.

3.1 | Confirmatory factor analyses

The confirmatory factor analysis models are equivalent in all three consumption domains (see Figure 2, including detailed model specifications). A confirmatory approach was chosen to test the hypothesized model, yet one data-driven alteration to the proposed model in Figure 1 is applied: the merger of perceptions regarding advertisement and social media peer content due to the finding that these perceptions are too strongly correlated to be distinguished (i.e., the items load on a common factor, Section 2.3). However, perceptions regarding "consumption-promoting online content" and "sufficiencypromoting online content" clearly form two different latent constructs. The leisure air travel model differed from the clothing and digital devices models in two ways: First, we had included four instead of two items to measure the latent factors "personal norm for sufficiency" and "sufficiency-promoting content perception." Second, the aspiration level was operationalized as two constructs rather than just one latent construct, due to low reliability of the joint "aspiration level" construct in this case (CR = 0.49 and AVE = 0.34). Hence, in the leisure air travel model only, we distinguished between "sufficient level of consumption" and "ideal level of consumption". This suggests that participants distinguish between their minimum and ideal level of air travel consumption, but not with regard to clothing and digital devices.

The reliability of latent constructs was assessed by Construct Reliability (CR) and Average Variance Extracted (AVE). No generally accepted minimum thresholds for these indicators exist, but the usually desired levels are >0.70 for the CR and >0.50 for the AVE, although slightly lower levels are often accepted (Bagozzi & Yi, 2012; Malhotra, 2006). The reliability of the aspiration level for digital devices (CR = 0.65, AVE = 0.51), the digital devices consumption level (CR = 0.68, AVE = 0.53) and the air travel consumption level (CR = 0.67; AVE = 0.47) are low, but deemed acceptable. All reliability measures are shown in Table 3. As listed in more detail in Figure 2, all CFA models had an acceptable fit, with RMSEA (root mean square error of approximation) \leq 0.06, the CFI (comparative fit index) \geq 0.95, and the SRMR (standardized root mean square residual) ≤ 0.08 (Hu & Bentler, 1998). The Tucker and Lewis index was slightly below the benchmark for a good fit in the clothing and digital devices models (TLI ≥ 0.95; Hu & Bentler, 1998), yet CFI and TLI > 0.90 are commonly accepted in practice if fit indices are acceptable overall (McDonald & Ho, 2002).

Table 3 reveals a strong correlation (0.80) between consumption and aspiration levels for digital devices, yet not so high as to question their discriminant validity. The two constructs are also relatively strongly correlated in the clothing domain, whereas for leisure air travel, the number of flights that participants deem necessary for their well-being and that they ideally would like to take are less strongly linked to actual consumption levels. The construct validity of actual consumption levels and aspiration levels is also supported by the facts that they are empirically clearly distinct in the two other domains and that they are theoretically clearly distinct. Social norms for sufficiency and for consumption are not correlated, nor are the personal norm for sufficiency and the aspiration level. Yet perceptions of digital content in the category of sufficiency and in the category of consumption are highly correlated. Participants perceiving more consumption-promoting digital content related to a product are also more likely to perceive corresponding sufficiencypromoting content, suggesting that both reflect how much a person is exposed to, and pays attention to online content.

3.2 | Structural equation modeling

SEM was employed to test hypothesized pathways, using the measurement model specifications that had been determined in the CFA analyses. Again, the SEM models show acceptable to good fit (Table 4). The clothing model accounts for 47% of the variance in the consumption level, the digital devices model for 69% of the variance, and the air travel model for 29% of the variance in the consumption level (see Table 4).

Figure 3 gives an overview of the structural model in all three domains, emphasizing the significant structural paths. In all domains, the aspiration level fully mediates the impacts on consumption levels of time spent online, consumption-promoting online content perceptions and motivational factors. However, in the clothing domain the amount of perceived consumption-promoting online content had an additional direct and positive impact on consumption. Despite that, in the leisure air travel domain, the aspiration level was split into two constructs (the subjectively sufficient and ideal level of air travel consumption), these two constructs together still had the strongest direct effect on air travel consumption. In addition, the social norm for consumption and perceived sufficiency-oriented content also had a direct effect on air travel consumption. Contrary to our hypotheses, the perception of sufficiency-oriented content actually was positively related to air travel consumption, and positively related to the subjectively sufficient amount of air travel.

Neither the perceived sufficiency-oriented content nor motives reflected in social and personal norms for sufficiency had an effect on aspiration levels or consumption levels in any of the domains. However, the perception of consumption-promoting online content had a strong direct positive link to aspiration levels in the clothing and digital devices domain. In the case of air travel, the connection of content perception to the ideal level of consumption was stronger than to the sufficient level of consumption, indicating that online advertisement and peer-generated content is more strongly related to the wish to travel more than a perceived actual need to travel. The relationship between consumption-promoting content perception and aspiration levels was only partially mediated by social norms for consumption.

The perception of sufficiency-promoting content was consistently positively related to sufficiency-oriented motivational factors, whereas the perception of consumption-promoting content was positively related to consumption-oriented motivational factors. Further, the expectation that the perception of consumption-promoting content inhibits sufficiency-oriented motives was confirmed in the digital devices and clothing domains. Here, there was a negative relationship between consumption-promoting content perception and the personal norm for sufficiency. In the clothing and air travel domains, perception of consumption-promoting content was negatively related to the social norm for sufficiency. However, sufficiency-promoting content did not inhibit consumption-oriented motives. The pathways reflecting hypothesized inhibitory effects of personal and social norm for sufficiency on aspiration levels were insignificant in all domains. Finally, the time spent online showed an equally positive link to both consumption- and sufficiency-promoting online content perception. In addition, in the digital devices and air travel domains, the time spent online had a weak positive direct effect on aspiration levels. In the case of digital devices, it may be that people who spend more time online actually have a higher perceived need for owning digital devices, irrespective of online content perception. In the case of leisure air travel, however, there seems less reason to expect an impact from aspiration levels to time spent online. In a nutshell, all models were consistent with the assumption that aspiration levels play an important role as the missing link between sufficiency-oriented norms and consumption levels. On the other hand, some expected effects were only found in some domains, but not in others, such as the negative effect of consumption-promoting content on sufficiency-oriented norms.

4 | DISCUSSION

The purpose of this study was to identify how exposure to online content may predict overconsumption and sufficiency, which might inform attempts to foster sufficiency-oriented lifestyles. First, the participants perceived more online content that promotes consumption than content that promotes sufficiency, suggesting that sufficiency marketing online is a niche phenomenon compared to conventional marketing (Gossen et al., 2019), and that also social media peer content is more often directed toward consumption than toward sufficiency. Also, the perception of consumption-promoting online content was connected to aspiration and consumption levels in the three studied domains, whereas the perception of sufficiencypromoting content was not. Further, perceptions of consumptionpromoting content were consistently linked to the social norm for consumption, which were linked to the aspiration levels, whereas perceptions of sufficiency-promoting content were consistently linked to social and personal norms for sufficiency, but there were no links from sufficiency norms to aspiration and consumption levels.

Thus, our study revealed that the aspiration level plays a key role as the only predictor directly linked to consumption levels in all consumption domains. This strong link reflects that, at least in our sample and for the chosen consumption domains, most participants are able to purchase the amount of clothing and digital devices they desire. The link was weaker for leisure air travel, which is also reflected in the disparity between the number of leisure air travels participants had undertaken and the substantially higher level of air travel consumption they deemed necessary for their well-being. With aspiration levels clearly surpassing actual consumption levels, these results reflect that leisure air travel is a growing consumption domain, resulting in increasing GHG emissions (Lenzen et al., 2018). A better understanding of the drivers of this consumption growth is key to reduce air travel and promote more sustainable lifestyles. Our study thus suggests that the most useful next step in an effort to reduce unsustainable consumption levels is to examine the predictors of aspiration levels as a key mediator.

We further found that social norms for consumption as well as exposure and attention to (i.e., perception of) consumption-promoting online content were directly linked to aspiration levels, and from there indirectly linked to higher consumption levels. However, we found no link between consumption levels or aspiration levels and the moral motives reflected in personal and social norms for sufficiency. This helps to explain Wang and Hao's (2018) findings that, on a macrolevel, sustainable consumption and internet penetration are not linked. It is also consistent with a prior study finding that proenvironmental intentions do not reduce individual consumption levels (or are even positively related), and the important role of air travel in this relationship (Moser & Kleinhückelkotten, 2017).

In addition, we found rather weak norms for sufficiency, both personal and social, in our samples. The social norm for sufficiency was stronger than the personal norm, suggesting that people generally feel a social pressure from others' expectations to show moderation, perhaps because they have adjusted their self-expectations for sufficiency downward to justify their consumption aspirations. The weak personal and social norm for sufficiency also suggest that sufficiency is not a salient moral motive, at least not in the examined domains of clothing, digital devices and air travel consumption, and compared to consumption-oriented motives. These results strongly support the

TABLE 3 Correlations and reliability of latent factors

			CR	AVE	2	3	4	5	6	7	8
1	Consumption level	Clothing	0.79	0.69	-0.01	0.62	-0.07	0.37	0.36	0.51	0.19
		Digital devices	0.68	0.53	-0.11	0.80	-0.13	0.40	0.43	0.53	0.30
		Leisure air travel (a) (b)	0.64	0.47	-0.01	0.36 0.32	0.06	0.30	0.39	0.36	0.19
2	Personal norm for sufficiency	Clothing	0.85	0.74		-0.16	0.45	0.03	0.28	0.02	-0.04
		Digital devices	0.86	0.76		-0.10	0.42	-0.05	0.15	-0.04	-0.05
		Leisure air travel (a) (b)	0.93	0.77		0.00 -0.11	0.57	-0.07	0.33	0.05	0–0.01
3	Aspiration level	Clothing	0.76	0.62			-0.15	0.39	0.23	0.50	0.19
		Digital devices	0.65	0.51			-0.02	0.39	0.34	0.48	0.32
	- leisure air travel	(a) Subjectively sufficient level	-	-			0.10	0.22	0.29	0.28	0.21
		(b) Ideal level of air travel consumption	-	-			-0.06	0.19	0.20	0.35	0.24
4	Social norm for sufficiency	Clothing	0.77	0.53				0.07	0.19	-0.01	0.02
		Digital devices	0.74	0.50				-0.11	0.12	0.04	0.06
		Leisure air travel	0.78	0.54				0.16	0.32	0.05	0.05
5	Social norm for consumption	Clothing	0.76	0.52					0.28	0.30	0.07
		Digital devices	0.75	0.50					0.35	0.35	0.20
		Leisure air travel	0.76	0.53					0.18	0.26	0.08
6	Sufficiency-promoting digital content	Clothing	0.80	0.67						0.62	0.22
		Digital devices	0.85	0.61						0.75	0.28
		Leisure air travel	0.87	0.68						0.58	0.29
7	Consumption-promoting digital content	Clothing	0.86	0.60							0.30
		Digital devices	0.78	0.64							0.32
		Leisure air travel	0.88	0.62							0.29
8	Time spent online		-	-							

Note: The correlation between (a) sufficient level and (b) ideal level of leisure air travel consumption is 0.37. Abbreviations: AVE, average variance extracted; CR, composite reliability.

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TABLE 4Estimated parameters of the hypothesized models (N_{Clothing} = 886, N_{Devices} = 860, N_{Travel} = 976)

	Clothing	g				Digital devices			Leisure air travel						
	b	SE	р	β	R ²	b	SE	р	β	R ²	b	SE	р	β	R ²
$PN{\rightarrow}CL$	0.06	0.05	.242	.05		0.00	0.07	.980	.00		-0.06	0.05	.207	06	
AL (SLC)→CL	0.51	0.06	<.001	.47		1.03	0.19	<.001	.69		0.20	0.05	<.001	.18	
ILC→CL											0.15	0.05	.001	.14	
$SNS{\rightarrow}CL$	-0.06	0.06	.353	04		-0.23	0.10	.017	13		-0.03	0.06	.668	02	
$SNC{\rightarrow}CL$	0.14	0.06	.029	.11		0.08	0.09	.368	.05		0.18	0.06	.002	.16	
$SOC{\rightarrow}CL$	0.15	0.08	.056	.11		0.22	0.14	.118	.13		0.30	0.09	<.001	.27	
COC→CL	0.22	0.08	.004	.17		0.14	0.15	.363	.08		0.09	0.07	.196	.08	
TO→CL	0.03	0.05	.605	.02		0.03	0.08	.707	.02		0.01	0.05	.894	.01	
Consumption level (CL)					.47					.69					.29
$SNS{\rightarrow}PN$	0.44	0.07	<.001	.39		0.44	0.07	<.001	.39		0.61	0.07	<.001	.51	
SNC→PN	-0.04	0.06	.513	07		-0.02	0.06	.744	02		-0.20	0.05	<.001	16	
$SOC{\rightarrow}PN$	0.37	0.07	<.001	.32		0.37	0.08	<.001	.34		0.30	0.06	<.001	.24	
COC→PN	-0.16	0.06	.007	28		-0.29	0.08	<.001	27		-0.07	0.05	.207	05	
TO→PN	-0.08	0.05	.071	07		-0.09	0.05	.054	08		-0.10	0.04	.015	08	
Personal norm for sufficiency (PN)					.27					.23					.39
$PN \rightarrow AL/SLC$	-0.11	0.05	.036	21		-0.07	0.05	.233	06		-0.08	0.04	.080	09	
SNS→AL/SLC	-0.12	0.06	.062	10		0.01	0.06	.853	.01		0.06	0.06	.300	.06	
$SNC \rightarrow AL/SLC$	0.34	0.06	<.001	.29		0.27	0.06	<.001	.24		0.14	0.05	.005	.14	
SOC→AL/SLC	-0.12	0.08	.138	10		-0.10	0.12	.398	09		0.19	0.07	.004	.18	
COC→AL/SLC	0.54	0.08	<.001	.46		0.46	0.10	<.001	.40		0.11	0.05	.026	.11	
TO→AL/SLC	0.06	0.05	.212	.05		0.20	0.06	.001	.17		0.12	0.04	.004	.11	
Aspiration level (AL)/ Sufficient level of consumption (SLC)					.36					.32					.14
PN→ILC											-0.09	0.05	.053	10	
$SNS{\rightarrow}ILC$											-0.04	0.06	.490	04	
$SNC{\rightarrow}ILC$											0.10	0.05	.044	.09	
$SOC{\rightarrow}ILC$											0.03	0.05	.580	.03	
COC→ILC											0.29	0.05	<.001	.28	
TO→ILC											0.15	0.04	<.001	.14	
Ideal level of consumption (ILC)															.17
$SOC{ o}SNS$	0.32	0.07	<.001	.32		0.19	0.07	.006	.19		0.46	0.07	<.001	.45	
COC→SNS	-0.21	0.07	.001	21		-0.12	0.07	.087	13		-0.21	0.06	<.001	20	
TO→SNS	0.01	0.05	.776	.01		0.05	0.05	.326	.05		-0.03	0.05	.587	02	
Social norm for sufficiency (SNS)					.06				.02						.13
$SOC \rightarrow SNC$	0.17	0.07	.016	.16		0.17	0.08	.036	.16		0.06	0.05	.192	.06	
$COC \rightarrow SNC$	0.21	0.07	.002	.21		0.20	0.08	.008	.20		0.22	0.06	<.001	.22	
TO→SNC	-0.03	0.05	.586	03		0.10	0.05	.056	.09		-0.01	0.05	.900	01	
Social norm for consumption (SNC)					.10					.14					.07
TO→SOC	0.22	0.04	<.001	.22		0.29	0.05	<.001	.28		0.31	0.05	<.001	.29	
Sufficiency-promoting content perception (SOC)					.05					.08					.09

TABLE 4 (Continued)

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	Clothing				Digital devices				Leisure air travel						
	b	SE	р	β	R ²	b	SE	р	β	R ²	b	SE	р	β	R ²
TO→COC	0.31	0.04	<.001	.30		0.33	0.05	<.001	.32		0.31	0.04	<.001	.29	
Consumption- promoting content perception (COC)					.09					.10					.09
Covariances:															
$SOC{\leftrightarrow}COC$	0.59	0.04	<.001	.59		0.73	0.03	<.001	.73		0.54	0.04	<.001	.54	
SLC↔ILC											0.28	0.04	<.001	.28	

Note: Model fit—Clothing domain: *χ*2 (*df* = 159) = 488.3, *p* < .001; RMSEA = .052; 90% Cl = [0.046, 0.057]; CFI = 0.953, TLI = 0.938; SRMR = 0.042; Digital devices domain: *χ*2 (*df* = 160) = 482.4, *p* < .001; RMSEA = 0.051; 90% Cl = [0.046, 0.057]; CFI = 0.955, TLI = 0.941; SRMR = 0.041; Leisure air travel domain: (*df* = 238) = 630.5, *p* < .001; RMSEA = 0.044; 90% Cl = [0.040, 0.048]; CFI = 0.964, TLI = 0.954; SRMR = 0.040.

Abbreviations: AL, aspiration level; CL, consumption level; COC, consumption-promoting content perception; ILC, ideal level of consumption; PN, personal norm for sufficiency; SLC, sufficient level of consumption; SNC, social norm for consumption; SNS, social norm for sufficiency; SOC, sufficiency-promoting content perception; TO, time spent online.



FIGURE 3 Structural equation models: summary of significant regression paths from online content exposure to consumption level. *Note*: Black: Relationship confirmed. Gray: relationship not as hypothesized (e.g., positive instead of negative). Full line: significant regression path in all domains. Dashed line: significant in two domains. Dotted line: significant in one domain. Non-significant paths are omitted

inclusion of predictors of overconsumption in sufficiency research, at least in the consumption domains examined. For air travel, sufficiency-oriented factors were even positively linked with air travel consumption, as well as with the subjectively sufficient level of air travel. Further research should verify this positive link, but one possible explanation is the more complex concept of sufficiency-oriented travel. It includes less travel, but also sustainable modes of transport, or making shorter trips. Through online personalization, searching for travel options in general may lead to more exposure to content that promotes all kinds of travel modes.

Overall, exposure to online content was reportedly rare in all samples, with an average of less than monthly. Especially sufficiencypromoting content was not perceived often. The low perception of consumption-promoting content is surprising and may be due to exposure to such content being underreported, perhaps due to limited attention and memory. Also, the perceived frequency of exposure may be influenced by the person's interests and motives: an environmentally conscious user may pay more attention to sufficiencypromoting social media posts, whereas a hedonically oriented user may pay more attention to advertisements for desired products. This implies that the relationship between online content perception and consumption levels may be due to both the exposure to online content causing a change in a person's motives and behavior, and the person's motives determining which online content is more consciously attended to and processed. In future research, these relationships should be examined in more detail, including experimental designs.

4.1 | Limitations

It is a strength of this study that it covers three consumption domains, thus rendering results regarding the relationship between online content perception and consumption levels more generalizable. On the other hand, the differing relationships between mediating constructs in the domains of product purchases (clothing and digital devices) and purchase of services (travel) may also reflect

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that consumption decisions are made differently in these domains, and that not all relevant constraints and motives were covered by the survey.

It goes without saying that with cross-sectional survey data, no causal conclusions can be drawn. The presented regression analyses are a first, necessary, but not sufficient step to investigate the possible causal influence of digital environments on consumption behavior. As mentioned earlier, the relationship between perceived content and behavior is likely to be reciprocal: Online environments adapt to their users through personalization, leading to positive feedback loops in which online environments shape motivations and behaviors of the users while the users' behaviors shape the way the Internet presents itself to them. So, while environmentally friendly users are more exposed and pay more attention to sustainable consumption options and information that are consistent with their values, more hedonistic or status-oriented consumers may receive and pay attention to exactly those posts and advertisement that trigger increased consumption. Causal relationships in societal developments are difficult to establish through existing methodologies, as they are difficult to reconstruct in an experimental setting, and to measure in surveys (e.g., Aguiléra et al., 2012). Besides, digital environments are constantly changing making it uncertain whether online phenomena included in current research will still be relevant for future research.

Another limitation regards sample representativeness, which was approached, but not completely achieved. For example, the air travel sample had a slightly higher income than the other two samples. Further, individual consumption levels were measured with self-reports, but could in principle be measured in more valid ways, for example, using real-time purchasing documentation.

4.2 | Research and practical implications

The important relationships identified in this study should be validated in longitudinal and experimental research to better understand the direction and causality between the factors. We provide a first step by identifying relationships that might serve as the point of departure for experimental research tackling overconsumption in a digitalized world. As Stephen (2016) pointed out, to examine impacts of online environments on users, it is necessary to consider also longterm effects, as effects of online content perception may be subtle, but cumulatively important. We suggest that experimental studies looking into short-term changes in salience (e.g., Bauer et al., 2012) as well as long-term cohort surveys in the manner of the study at hand, integrated by a cross-lagged panel designs (for an example, see Thøgersen & Ölander, 2006), may be able to capture important longterm effects of exposure to online content.

It is particularly noteworthy that consumption-oriented motives and aspiration levels appear to be strongly connected to consumption levels, whereas sufficiency-oriented motives are not. It is possible that, for the domains in focus here, normative motives are less salient overall than in some other domains, such as energy saving behavior, where moral motives were repeatedly shown to be central behavioral predictors (e.g., Abrahamse et al., 2005; Bamberg & Möser, 2007). At least in the domains studied here, an important implication is to study not only interventions that foster proenvironmental behavior, but also examine in more detail the antecedents of unsustainable consumption (Thøgersen, 2014), calling into question the commercialisation of online environments that seem to boost consumption aspirations at the expense of ecological and social well-being (Bauer et al., 2012; Kasser & Kanner, 2004). In the case of marketing practices, both sufficiency-promoting communication and avoidance of aggressive consumption promotion have been proposed (Bocken & Short, 2016; Gossen et al., 2019). Yet our findings suggest that avoiding consumption promotion is more effective than promoting sufficiency. A possible explanation is that in the "consumerist culture" that is ubiquitous today (e.g., Kasser & Kanner, 2004), practicing sufficiency would require stronger measures, including normative and cultural transformations, than the online sufficiency promotion perceived to be so rare by the participants in this study. As a practical implication, prescriptive knowledge might be needed on how to regulate online advertisement that boosts consumption levels. This should be combined with efforts to decrease data traffic from online advertisement, which has been shown in itself to have a negative environmental impact (Pärssinen et al., 2018).

5 | CONCLUSION

This study addressed several research gaps that opened for important contributions to sufficiency research. The main focus of behavioral, environmental research is often to predict or foster sustainable consumption, and less on examining predictors or antecedents of unsustainable consumption (Thøgersen, 2014; Uzzell æ Räthzel, 2009). In this connection, the current study stands out by focussing on impediments to sustainable consumption, such as aspiration levels that exceed objective needs. Similarly, this study contributes to integrating contextual factors by examining links of sustainable consumption to two central aspects of online environments. Also, contextual factors are underrepresented in current research on fostering pro-environmental behavior (Osbaldiston, 2013; Steg & Vlek, 2009).

To summarize, we found that aspiration levels are boosted by consumption-promoting digital content and together with social norms for consumption they are important predictors of unsustainably high consumption levels. Sufficiency norms, as well as sufficiencypromoting online contents, are currently too rare to play a role for consumption levels. It seems that refraining from consumption promotion triggering material aspirations is more effective at fostering sufficiency than is the boosting of sufficiency-promoting online content. However, since digitalization is an ongoing and fast-changing societal process, it is challenging to study. More and different types of empirical studies are needed to establish how strong and important the link is between exposure to online content and (un)sustainable consumption. Future research should include more consumption

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domains as well as experimental and longitudinal research designs. It seems very likely that information technologies can be used for both sufficiency and increasing consumption. As Bandura (2002, p. 4) puts it, information technologies are "a tool, not a panacea." In order to apply this tool in the service of a sustainable society, and not only in the service of corporate interests, further research is needed on how online environments can be designed to foster sufficiency-oriented consumption.

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CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

ETHICS STATEMENT

Participants were informed on the type and use of the data collected and on voluntary participation, and they were debriefed and financially reimbursed for their efforts.

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APPENDIX A: ITEM LIST AND FACTOR LOADINGS

TABLE A1 Factor loadings clothing survey

Item	Formulation	b	SE	р	b			
Consumption lev	rel							
cl1	Number of clothing items purchased in 3 months	1.96	0.14	<.001	0.90			
cl2	Yearly expenditure	0.89	0.07	<.001	0.64			
Personal norm f	or sufficiency							
pn1	Due to values that are important to me, I feel obliged to keep the amount of clothing I buy low.	1.45	0.08	<.001	0.87			
pn2	For reasons of environmental protection, I have a bad conscience if I buy more new clothes than I really need.	1.46	0.08	<.001	0.85			
Aspiration level								
al1	Sufficient level of consumption	5.23	0.35	<.001	0.71			
al2	Ideal level of consumption	8.44	0.50	<.001	0.83			
Social norm for	sufficiency							
sns1	People who are important to me try to keep their clothing purchases as low as possible.	0.81	0.08	<.001	0.51			
sns2	People who are important to me like if I try to keep my clothing purchases as low as possible.	1.36	0.07	<.001	0.83			
sns3	People who are important to me like if I only buy as many pieces of clothing as I really need.	1.36	0.07	<.001	0.80			
Social norm for consumption								
snc1	People who are important to me buy new clothing for themselves regularly.	0.86	0.07	<.001	0.57			
snc2	People who are important to me like if I buy new clothing regularly	1.20	0.07	<.001	0.77			
snc3	People who are important to me like if I dress in the latest fashion.	1.33	0.07	<.001	0.78			
Sufficiency-pron	noting online content							
soc1	I see online advertisement or offers to buy LESS new clothing (e.g., banners, on social media).	0.73	0.07	<.001	0.73			
soc2	I see posts, discussions or likes on social media on the topic of repair or non-consumption.	0.95	0.05	<.001	0.89			
Consumption-pr	omoting online content							
coc1	I see online adverisement for clothing in search engines on or websites (e.g., ads and banners).	1.42	0.05	<.001	0.86			
coc2	I see advertisement for clothing when using entertainment media (e.g., Youtube and streaming).	1.43	0.05	<.001	0.89			
coc3	I see advertisement for clothing on social media.	1.05	0.05	<.001	0.80			
coc4	I see on social media that my friends like pages or vendors of clothing and fashion.	1.58	0.05	<.001	0.84			
coc5	I see posts, discussions or likes about clothing and fashion on social media.	1.08	0.05	<.001	0.59			
coc6	I see on social media when friends have bought new clothing for themselves.	1.08	0.06	<.001	0.65			
Time spent onlir	e							
to1	Time spent online	2.26	0.07	<.001	0.95			

TABLE A2 Factor loadings digital devices survey

Item	Formulation	b	SE	р	b		
Consumption lev	el						
cl1	Number of digital devices purchased in 2 years	1.04	0.11	<.001	0.77		
cl2	Yearly expenditure	1.52	0.17	<.001	0.71		
Personal norm fo	or sufficiency						
pn1	Due to values that are important to me, I feel obliged to keep the amount of digital devices I buy low.	1.56	0.05	<.001	0.90		
pn2	For reasons of environmental protection, I have a bad conscience if I buy more new digital devices than I really need.	1.56	0.05	<.001	0.84		
Aspiration level							
al1	Sufficient level of consumption	1.12	0.10	<.001	0.64		
al2	Ideal level of consumption	2.45	0.14	<.001	0.74		
Social norm for s	ufficiency						
sns1	People who are important to me try to keep their digital devices purchases as low as possible.	0.81	0.08	<.001	0.49		
sns2	People who are important to me like if I try to keep my digital devices purchases as low as possible.	1.45	0.07	<.001	0.87		
sns3	People who are important to me like if I only buy as many pieces of digital devices as I really need.	1.16	0.08	<.001	0.72		
Social norm for consumption							
snc1	People who are important to me buy new digital devices for themselves regularly.	0.95	0.08	<.001	0.57		
snc2	People who are important to me like if I buy new digital devices regularly	1.32	0.07	<.001	0.82		
snc3	People who are important to me like if I own the newest technology.	1.17	0.08	<.001	0.71		
Sufficiency-prom	noting online content						
soc1	I see online advertisement or offers to buy LESS new digital devices (e.g., banners and on social media).	0.83	0.06	<.001	0.73		
soc2	I see posts, discussions or likes on social media on the topic of repair or non-consumption.	0.96	0.05	<.001	0.87		
Consumption-pro	omoting online content						
coc1	I see online advertisement for digital devices in search engines on or websites (e.g., ads and banners).	0.96	0.05	<.001	0.58		
coc2	I see advertisement for digital devices when using entertainment media (e.g., Youtube and streaming).	1.05	0.05	<.001	0.66		
coc3	I see advertisement for digital devices on social media.	1.35	0.04	<.001	0.83		
coc4	I see posts, discussions or likes about digital devices and fashion on social media.	1.29	0.04	<.001	0.86		
coc5	I see on social media that my friends like pages or vendors of digital devices and technology.	1.30	0.04	<.001	0.91		
сосб	I see on social media when friends have bought new digital devices for themselves.	1.10	0.05	<.001	0.87		
Time spent onlin	e						
to1	Time spent online	2.16	0.07	<.001	0.95		

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TABLE A3 Factor loadings leisure air travel survey

Item	Formulation	В	SE	р	b			
Consumption I	level							
cl1	Number of flights last year	2.07	0.21	<.001	0.82			
cl2	Yearly expenditure on air travel	2.52	0.20	<.001	0.63			
Personal norm	for sufficiency							
pn1	Due to values that are important to me, I feel obliged to chose environmentally friendly alternatives to air travel.	1.34	0.05	<.001	0.84			
pn2	For reasons of environmental protection, I have a bad conscience if I travel by plane.	1.44	0.06	<.001	0.90			
pn3	Due to values that are important to me, I feel obliged to keep my number of travels low.	1.34	0.05	<.001	0.88			
pn4	For reasons of environmental protection, I have a bad conscience if I travel more than I really need to.	1.40	0.06	<.001	0.90			
Aspiration leve	el (two separate factors)							
al1	Sufficient level of consumption	2.05	0.09	<.001	0.95			
al2	Ideal level of consumption	3.49	0.09	<.001	0.95			
Social norm fo	r sufficiency							
sns1	People that are important to me try to find environmentally friendly alternatives to flights when traveling (e.g., bus and train)	1.18	0.06	<.001	0.71			
sns2	People that are important to me approve of me trying to keep the amount of my travels low.	1.09	0.08	<.001	0.63			
sns3	People that are important to me approve of me chosing environmentally friendly alternatives to flights when traveling (e.g. bus, train)	1.47	0.07	<.001	0.86			
Social norm for consumption								
snc1	People that are important to me regularly book new travels.	0.90	0.08	<.001	0.52			
snc2	People that are important to me approve of me regularly traveling to new destinations.	1.19	0.08	<.001	0.75			
snc3	People that are important to me approve of me regularly booking new travels.	1.50	0.06	<.001	0.89			
Sufficiency-pro	omoting online content							
soc1	I see advertisement or offers on the internet to go on LESS long-distance travels (e.g., for holidays at home).	0.71	0.05	<.001	0.77			
soc2	I see advertisement or offers on the internet for environmentally friendly alternatives to air travel (e.g., for traveling by public transport and bike).	0.84	0.05	<.001	0.88			
soc3	I see posts, discussions or likes on social media on avoiding long-distance travel or spending holidays at home.	0.75	0.05	<.001	0.75			
soc4	I see posts, discussions or likes on social media on the topic of environmentally friendly alternatives to air travel (e.g., for traveling by public transport and bike).	0.85	0.04	<.001	0.90			
Consumption-	promoting online content							
coc1	I see online advertisement for travels on search engines or on websites (e.g., banners).	0.92	0.05	<.001	0.61			
coc2	I see advertisement when using entertainment media (e.g., youtube and streaming).	0.89	0.05	<.001	0.65			
coc3	I see advertisement for travels on social media.	1.29	0.04	<.001	0.86			
coc4	I see posts, discussions and likes on social media on the topic of digital devices and trends.	1.28	0.04	<.001	0.81			
coc5	I see that my friends like providers of digital devices on social media.	1.19	0.05	<.001	0.83			
coc6	I see on social media, when friends have bought new digital devices for themselves.	1.35	0.04	<.001	0.91			
Time spent on	line							
to1	Time spent online	2.19	0.07	<.001	0.95			

APPENDIX B: EXPLORATORY FACTOR ANALYSIS FOR ITEMS MEASURING DIGITAL CONTENT PERCEPTION

TABLE B1 Exploratory factor analysis for items measuring digital content perception in the clothing domain

	Compone	nt
	1	2
I see advertisement for clothing on social media.	0.86	0.22
I see on social media that my friends like pages or vendors of clothing and fashion.	0.82	0.32
I see posts, discussions or likes on social media on the topic of clothing and fashion.	0.80	0.37
I see online adverisement for clothing in search engines on or websites (e.g., ads and banners).	0.80	0.02
Ich see advertisement for clothing when using entertainment media (e.g., Youtube and streaming).	0.77	0.16
I see on social media when friends have bought new clothing for themselves.	0.68	0.46
I see online advertisement or offers to buy LESS new clothing (e.g., banners, on social media).	0.13	0.89
Ich see posts, discussions or likes on social media on the topic of repair or non-consumption.	0.27	0.85

Note: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. Rotation converged after three iterations.

TABLE B2Exploratory factor analysis for items measuring digitalcontent perception in the digital devices domain

	Component	
	1	2
I see online advertisement for digital devices on search engines or websites (e.g., banners).	0.87	0.07
I see advertisement for digital devices when using entertainment media (e.g., youtube and streaming)	0.83	0.22
I see advertisement for digital devices on social media.	0.78	0.43
I see posts, discussions and likes on social media on the topic of digital devices and trends.	0.71	0.53
I see advertisement and offers on the internet to buy LESS digital devices (e.g., banners).	0.09	0.85
I see posts, discussions or likes on repair and consumption reduction on social media.	0.25	0.82
I see on social media, when friends have bought new digital devices for themselves.	0.55	0.66
I see that my friends like providers of digital devices on social media.	0.62	0.64

Note: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. Rotation converged after three iterations.

TABLE B3 Exploratory factor analysis for items measuring digital content perception in the leisure air travel domain

	Compone	ent
	1	2
I see advertisement for travels on social media.	0.87	0.21
I see posts, discussions or likes about travels on social media.	0.87	0.21
I see holiday posts and fotos from my friends on social media.	0.85	0.09
I see on social media, that my friends like travel providers.	0.79	0.29
I see online advertisement for travels on search engines or on websites (e.g., banners).	0.73	0.13
I see advertisement when using entertainment media (e.g., youtube and streaming).	0.71	0.28
I see advertisement or offers on the internet to go on LESS long-distance travels (e.g., for holidays at home).	0.13	0.93
I see posts, discussions or likes on social media on avoiding long-distance travel or spending holidays at home.	0.30	0.86

Note: Extraction method: principal component analysis. Rotation method: varimax with Kaiser normalization. Rotation converged after three iterations.