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When your shop says #lessismore. Online communication interventions for clothing sufficiency

Vivian Frick [a,b,*], Maike Gossen [a,c], Tilman Santarius [a,c,d], Sonja Geiger [e]

[a] Institute for Ecological Economy Research, Potsdamer Str. 105, 10785, Berlin, Germany
[b] Center for Technology and Society, TU Berlin, Hardenbergstr. 16-18, 10623, Berlin, Germany
[c] Department of Social Transformation and Sustainable Digitalization, Institute for Vocational Education and Work Studies, TU Berlin, Marchstr. 23, 10587, Berlin, Germany
[d] Einstein Centre Digital Future, Wilhelmstraße 67, 10578, Berlin, Germany
[e] University of Giessen, Hesse, Germany

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ABSTRACT

To keep human resource consumption within planetary boundaries, individual consumption levels need to drop. We therefore investigated whether online communications interventions, especially on social media, can foster sufficiency in the clothing domain. In two experiments, consumption reduction and prolonging the lifetime of clothes were promoted. In Study 1, we conducted an online field intervention. All participants, both in the experimental and the control groups, reduced their clothing consumption. Hence, the intervention itself did not change clothing consumption levels. Study 2 was a laboratory experiment with sufficiency-promoting social media communication. Sufficiency-promoting communication led to more sufficiency behaviour compared to neutral and consumption-promoting communication. This effect was mediated by a lower desire to acquire new clothes (aspiration level). Peer endorsement of the communication by other social media users did not strengthen the communication's effect. However, the attitude towards the sender and the communication was more positive in the sufficiency-promoting communication than under the other two conditions. Although the field intervention was not effective, social media posts could increase sufficiency behaviour in the short-term. To test long-term effects, further experimental studies are needed.

1. Introduction

Climate change, biodiversity loss, environmental degradation and pollution are on the rise, and our society is facing the challenge of limiting their consumption's impacts to remain within planetary boundaries (Steffen et al., 2015). Three strategies are often proposed to face this challenge (Sachs, 2015). Following the efficiency strategy, production, use and disposal of consumed goods and services should require as little energy and few resources as possible, and following the consistency strategy, products should be biodegradable, reusable and environmentally friendly. These measures can only prove effective in combination with the sufficiency strategy, which requires behavioural changes of consuming less goods and services in absolute terms (Lorek & Fuchs, 2013; Spangenberg & Lorek, 2019). Sufficiency denotes a self-determined reduction of consumption levels in absolute terms while ensuring individual well-being (Princen, 2005). The affluent societies of the Global North could decrease resource use substantially without impairing well-being or the satisfaction of existential needs (O'Neill et al., 2018). At the level of individual consumption, sufficiency behaviour means reducing the purchase of new resource-intense goods, choosing goods that are smaller or of lower capacity, or using resource-intense goods and services less often (Jenny, 2016).

The clothing domain is especially prone to overconsumption, and the vast majority of clothes are produced under socially and ecologically unsustainable conditions (Ellen MacArthur Foundation, 2017). The fast-fashion system amplifies consumption habits such as buying more items and wearing them less frequently. Accordingly, Europe experienced a 40% increase in clothing purchases between 1996 and 2012 (European Environment Agency, 2014). Decreasing clothing purchases and increasing garment lifetimes can help minimize and mitigate the

* Corresponding author. Institute for Ecological Economy Research, Potsdamer Str. 105, 10785, Berlin, Germany.
E-mail addresses: vivian.frick@ioew.de (V. Frick), maike.gossen@ioew.de (M. Gossen), santarius@tu-berlin.de (T. Santarius), Sonja.Geiger@fb09.uni-giessen.de (S. Geiger).

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environmental impacts of the clothing industry (Niinimäki et al., 2020). In line with the above characterisation, sufficiency behaviour in the clothing consumption domain means reducing the purchase of new clothing and prolonging product lifetime by engaging in behaviours such as care, repair, second-hand acquisition, and clothing exchange.

While clothing sufficiency is currently a niche phenomenon in the Global North (Kleinhückelkotten & Neitzke, 2019), consumption-promoting communication predominates in online environments (Frick et al., 2021): Online marketing is ubiquitous, increasingly intrusive, and primarily targets increased consumption (Pappas et al., 2017). Clothing is among the goods most strongly advertised online (Statista, 2019), and clothing-related communication in social media abounds. Social media use is also related to conspicuous consumption (Taylor & Strutton, 2016), and the majority of studies concerning social media's influence on consumption focus on the marketing perspective of increasing consumption. Nevertheless, online environments can also support consumption reduction. Currently, a growing interest in sufficiency can be observed through sustainability trends such as minimalism, slow fashion, or voluntary simplicity (e.g., Etzioni, 1998; Jung & Jin, 2016).

We report on two consecutive studies on sufficiency-promoting communication in online environments. In Study 1, we conducted a field experiment with customers of a sustainable online shop. We studied behavioural change towards clothing sufficiency by examining the impact of an online intervention applying sufficiency-promoting communication in social media. Study 2 was an online laboratory experiment with a representative sample of social media users. There, we investigated the impact of sufficiency-promoting communication on sufficiency behaviour and on attitudes towards the communication and its sender, and compared it with the impact of consumption-promoting communication and with a neutral condition without any consumption-related content. Additionally, we tested whether peer endorsement through likes and comments from other social media users increased the effect of sufficiency-promoting or consumption-promoting communication.

1.1. Sufficiency interventions

From a theoretical standpoint, Steg and Vlek (2009) categorize behaviour change interventions for pro-environmental behaviour into structural strategies and informational strategies. Structural strategies consist of providing incentives to reduce behavioural costs and increase self-efficacy. Informational strategies induce motivational change, e.g., increasing knowledge or changing motives such as social or personal norms towards pro-environmental behaviour. According to the multiple goals theory (Lindenberg & Steg, 2007), these motivational changes can be induced for three motive categories, that are relevant for pro-environmental behaviour: Normative motives of what one should do to reflect personal or social norms, gain motives of what brings personal advantages, and hedonic motives of what feels good. Informational strategies can thus foster sufficiency behaviour by strengthening normative motives towards sufficiency, decreasing gain and hedonic motives opposed to consumption reduction, or aligning gain and hedonic motives with normative motives (Steg et al., 2014; Steg & Vlek, 2009).

The normative motive can be addressed by means of the personal norm. It describes a feeling of moral obligation and is a widely established determinant of pro-environmental behaviour (Schwartz, 1977; Steg & Vlek, 2009). A recent study discovered personal norms to be especially relevant for sufficiency intentions in clothing (Joanes et al., 2020). Moreover, normative goal framing can increase sufficiency behaviour (Thøgersen & Alfinito, 2020). Normative motives also include what individuals perceive as a social norm in their community. Descriptive social norms are especially effective in pro-environmental behaviour change by providing normative information about a peer group's behaviour (Abrahamse & Steg, 2013; Cialdini et al., 1991; Goldstein et al., 2008). They also increase the effectiveness of informational strategies (Abrahamse & Matthies, 2012).

Gain and hedonic motives may weaken sufficiency behaviour, for example when hedonic enjoyment or comfort through consumption are in conflict with consumption reduction (Steg et al., 2014). Accordingly, some hedonic values negatively relate to sustainable fashion consumption (Geiger & Keller, 2018). To many, the experience of shopping is rewarding (hedonic shopping value, Babin et al., 1994). Status and conspicuous consumption both describe the desire to increase one's status or social prestige by acquiring consumer goods, including clothing and fashion (O'Cass & McEwen, 2004). Conspicuous consumption is also an outcome of materialism, which describes the belief that well-being can be attained through acquiring goods (Goldsmith & Clark, 2008), and negatively correlates with pro-environmental behaviour (Hurst et al., 2013; Kasser & Kanner, 2004). Additionally, the activation of self-enhancement values such as material aspirations has been shown to weaken self-transcendence values such as environmentalism and benevolence, and vice versa (Maio et al., 2009). The motive to pursue gain and hedonic motives by frequent consumption can be operationalised as the aspiration level. It has been examined in a consumption context by Easterlin (2001), who measured material aspirations as the importance of owning certain material goods (e.g., a car, a house, or clothes in the latest style). Similarly, Karlsson et al. (2004, p. 755) define the aspiration level as "the degree to which households consider consumption of different goods and services to be necessary". Finally, in a psychological setting, it was defined as the perceived need or desire to acquire goods and services (e.g., Frick et al., 2021; Jenny, 2016).

As a result, we expect that framing communication on consumption reduction with intrinsic, non-materialistic benefits of sufficiency (e.g., lightness, freedom, autonomy, meaning in life) decreases the hedonic motive of aspiration levels and thus strengthens sufficiency behaviour (Pelletier & Sharp, 2008; Steg et al., 2014). Such communication may allow materialistic motives to be replaced by non-materialistic ones: embedded in concepts such as voluntary simplicity or minimalism, sufficiency behaviour has personal advantages such as monetary savings and less pressure to earn money to spend (Etzioni, 1998).

1.2. Sufficiency communication on social media

To apply the described sufficiency interventions, online environments offer various new possibilities (Guadagno & Cialdini, 2005). Blogs, websites, smartphone applications, and social media offer new channels for providing sustainability-related information that is accessible to users at anytime and anywhere (Börjesson Rivera et al., 2014; Frick & Santarius, 2019). For example, in an online shop, communicating sustainability-oriented descriptive norms can increase sustainable product choice (Demarque et al., 2015).

Communication interventions on social media are expected to be especially effective due to social influence, with some authors claiming they may be as influential as face-to-face interactions while having a wider reach (Goldsmith & Goldsmith, 2011). Arguably, social media can improve distribution of pro-environmental social norms (Ballew et al., 2015). A field experiment on social influence and political mobilization showed, albeit with a small effect size, that social media posts influence individual decision-making on a large scale (Bond et al., 2012). The study found it was the descriptive social norm demonstrated by close peers that particularly influenced decision-making. Peer communication can lead to behavioural and motivational change through social influence such as social learning (Bandura, 2009), social norms, or persuasion (Guadagno & Cialdini, 2005). Accordingly, an online intervention including visible peer engagement on social media was effective in encouraging college students to save energy (Senbel et al., 2014). A social media field experiment aiming at reducing food waste, however, found no effects (Young et al., 2017).

"Peer endorsement" is used to describe when peers visibly embrace social media communication (e.g., videos or pictures) with likes, shares,

and supportive comments. It has been shown to influence behaviour and a communication's popularity (e.g., Sherman et al., 2016; Tofighi et al., 2020). Similar concept used in informatics and marketing research are "social contagion", describing peer influence through social media networks (e.g. to promote products, Aral & Walker, 2012; Langley et al., 2010) or "word-of-mouth", the impact of informal communications between social media users on consumption decisions (Chevalier & Mayzlin, 2006; Stephen, 2016). In this study, we therefore expect that peer endorsement of a company's sufficiency communication strengthens the descriptive social norm for sufficiency and thereby, behaviour.

1.3. Companies as senders of sufficiency interventions

Marketing endeavours to promote consumption reduction for a social purpose mostly stem from political or civic actors (McKenzie-Mohr, 2011). Yet commercial actors can also play their part in fostering sufficiency (Bocken & Short, 2016; Heikkurinen et al., 2019). They may foster sufficiency through their marketing activities since those activities create and maintain customer relationships and can effectively influence consumption decisions. Sufficiency-promoting marketing focuses on satisfying 'needs' rather than promoting 'wants' and aims at only selling the customer what she or he needs at the moment of purchase (Bocken et al., 2020; Gossen & Frick, 2018). This strategy is increasingly proving its relevance – both in practice, shown, for example, in Patagonia's prominent campaign "Don't buy this jacket" (Hwang et al., 2016), and in scientific discourse (Gossen et al., 2019). There are other marketing concepts that seek to reduce consumption, such as demarketing (Cullwick, 1975; Kotler and Levy 1975) or social marketing (Andreasen, 1994; Peattie and Peattie 2009). What differentiates sufficiency-promoting marketing from those concepts is the clear focus on voluntary behaviour change, the contribution to sustainability through consumption reduction, and the fact that the sender is a commercial actor.

Companies might not implement sufficiency-promoting marketing if it appears unusual, controversial, or untrustworthy in the eyes of their customers and leads to image loss (Gossen et al., 2019). Empirical studies on sufficiency-promoting advertising show that customers perceive the company as more altruistic (i.e., socially and environmentally beneficial) and strategic (e.g., customer loyalty or profit), but exploitative motives in the sense of greenwashing are often not assumed (Armstrong Soule & Reich, 2015; Gossen & Frick, 2018). Ramirez et al. (2017) further found companies applying sufficiency-promoting communication to be perceived more environmentally concerned and trustworthy.

1.4. Two-study outline

We combined a field experiment to maximize external validity (Study 1) with a laboratory experiment to maximize internal validity (Study 2) (Lusk et al., 2006). With Study 1, we tested whether online sufficiency-promoting communication can increase sufficiency behaviour and if so, which motives mediate this effect. The longitudinal design enabled us to measure consumption levels of clothing over two periods of four weeks. However, the transdisciplinary approach posed practical constraints that prevented all our hypotheses from being addressed. Also, a substantial long-term effect of a single instance of sufficiency-promoting communication is somewhat unlikely, due to the sheer amount of competing in online environments, especially from marketing sources promoting consumption. Yet, as shown by Bond (2012), even very small interventions can have a significant impact on attitudes and behaviour when communication is broadcast to a big enough target group. Therefore, in an exploratory approach, we examined the hypothesis that sufficiency-promoting communication on social media can in fact change sufficiency behaviour, albeit with a small effect size. Further, the field experiment provided a conceptual and exploratory setting to determine whether there were small effects of the field intervention.

To gain additional insights on short-term effects of sufficiency-promoting communication in a controlled setting and to address further hypotheses that could not be examined in the field, we conducted a complementary laboratory experiment. Study 2 included best-practice strategies that strengthen internal validity. Full randomisation was provided by the laboratory setting, and the experiment was assessed and approved by an ethical committee. In a cross-sectional design, sufficiency behaviour was assessed as an ad-hoc consumption decision. Study 2 included and manipulated further factors such as the comparison of sufficiency-promoting and consumption-promoting communication with a neutral communication condition. It also intended to deepen the understanding of social norms by investigating the effect of peer endorsement on social media. Additionally, we addressed the organisational perspective on practicability and appeal of sufficiency-promoting communication. For these purposes we tested how the attitude towards sufficiency communication and its sender differ between the sufficiency-promoting, consumption-promoting and neutral communication condition.

2. Study 1: Exploratory field experiment

2.1. Hypotheses

The main hypothesis addresses the effectiveness of an intervention in online environments via social media and newsletters that promote sufficiency behaviour, with a clothing company sending the communication. The communication's impact can be measured by self-reported sufficiency behaviour. Notably, based on the literature, this online intervention is expected to yield only a small effect.

H1a. Sufficiency-promoting communication increases sufficiency behaviour compared to a neutral communication condition.

Past research ascribed effects of social media on behaviour change largely to the perception of social norms. As social norms play a major role in pro-environmental behaviour, we expect that the sufficiency-promoting communication strengthens social norms, which then supports sufficiency behaviour.

H2a. The perceived descriptive social norm mediates the positive impact of sufficiency-promoting communication on sufficiency behaviour.

At the same time, moral motives are established drivers for pro-environmental behaviour. We expect sufficiency-promoting communication to strengthen the personal norm for sufficiency. As a mediator, it promotes sufficiency behaviour.

H3a. The personal norm for sufficiency mediates the positive impact of sufficiency-promoting communication on sufficiency behaviour.

Sufficiency-promoting communication highlights non-materialistic values and decreases hedonic and gain motives for consumption. We expect a mediating effect for the aspiration level for clothing:

H4a. A decrease in the aspiration level for clothing mediates the positive impact of sufficiency-promoting communication on sufficiency behaviour.

2.2. Method

Study 1 was designed as a field experiment to measure the impact of a sustainable online shop's sufficiency-promoting communication on its customers. In a quasi-experimental design, the subjects were assigned to either the experimental or control group by self-report of intervention perception. In a longitudinal design, sufficiency behaviour, operationalised as clothing consumption levels, was assessed before (T1) and

after the intervention (T2, T3).

2.2.1. Sample

The sample consisted of customers of the sustainable online shop. Prior to the intervention, participants were recruited by the online shop's newsletter (invitation newsletter). As described, only a small effect was expected from the field experiment. For a small effect size of f = 0.05, given $\alpha = 0.05$ and Power = 0.95, power analysis with G*Power indicated a sample size of 1302 participants. In fact, however, sample size was determined by the return rate on the online shop's invitation. In total, $N = 3308$ participants completed the T1 questionnaire, yet only $N = 3278$ gave their e-mail address. They received an invitation for the second questionnaire (T2), which was completed by $N = 2405$ participants (27% drop-out rate). $N = 2113$ participants filled out the third questionnaire (T3), representing the final sample (36% drop-out rate from T1). This convenience sample (Table 1) cannot be generalised for the German population, but was typical for the customers of the sustainable online shop, with a high rate of young, female participants, with low income and a high education level (as shown in a previous study by Gossen & Frick, 2018). Compared to the control group, the experimental group was younger, $t(2105) = 4.05$, $p < .001$, had a slightly lower education level, $\chi^2(2) = 12.46$, $p < .01$, and a lower income, $t(744.4) = 4.41$, $p < .001$ a higher percentage was female, $\chi^2(3) = 24.58$, $p < .001$, spent more time online, $t(2079) = -2.16$, $p < .001$, $d_{Cohen} = 0.12$, and had slightly higher environmental awareness, $t(2110) = -2.75$, $p < .01$, $d_{Cohen} = 0.13$.

2.2.2. Material

The intervention was planned in a transdisciplinary process (Lang et al., 2012). This means that the online shop was involved in the formulation of the research question, the design of the study, and the interpretation of the results. The study design was co-produced during several workshops and meetings with representatives of the online shop. As a result, a 'theme week' intervention was implemented, during which the online shop promoted clothing sufficiency through its social media accounts and in one of their weekly newsletters (intervention newsletter), along with the hashtag #lessismore. The intervention advertised the benefits of buying less and only owning 'favourite pieces'. The intervention newsletter, presented different styling options for a single clothing piece (trousers). On Instagram and Facebook, a staff member of the online shop posted photos and stories on a daily basis, showing alternative outfits for her favourite trousers and presenting capsule wardrobe collections. In addition, polls for feedback were conducted, and discussions and interactions with the online shops' followers about the benefits of sufficiency in their dealings with fashion were initiated in the comments section of the social media channels.

Table 1
Sample description of the field experiment.

	Field experiment	
	Control group	Experimental group
	$N = 1685$	$N = 428$
Age *M (SD)*	33.5 (10.5)	30.6 (9.9)
Education level*	7.2% secondary	10.3% secondary
	30.2% undergraduate	35.3% undergrad.
	59.2% graduate	49.5% graduate
Income *M (SD)*	1524 (1134) €	1282 (981) €
Gender*	79.6% female	90.0% female
	18.9% male	9.1% male
Online h/day	2.82 (1.67)	3.02 (1.67)
Environmental awareness	4.53 (0.38)	4.58 (0.34)

Notes. Percentages not adding up to 100% due to participants choosing "other" or "no indication".
Range environmental awareness: 1 = very low, 5 = very high.

2.2.3. Procedure

The sustainable online shop recruited participants via their weekly newsletter, inviting its customers to take part in an online survey (invitation newsletter on week prior to the intervention newsletter), incentivised by a coupon raffle. The invitation gave no indication on the topic of the survey. In the first survey before the intervention (T1, Fig. 2), the self-reported amount of new and second-hand clothing purchased in the previous four weeks, as well as aspiration level, personal norm and social norm for sufficiency were assessed. Additionally, e-mail addresses were collected in order to send out the post-surveys. The survey contained further scales on frugality, materialism, fashion consciousness and attitude towards the sender, which are, however, not included in this study. After the intervention week, participants were invited to take part in the second survey (T2). Here, participants completed a manipulation check by stating whether they had taken note of the #lessismore theme week. We assessed whether participants remembered the intervention newsletter, two exemplary posts from social media, and they could further indicate whether they had seen any comments on the posts from other social media users or whether they had commented on the posts themselves. If participants recalled at least one of the communication tools shown in screen-shots or reported to have seen comments or have commented, they were assigned to the experimental group. Participants who did not agree with any of these statements were assigned to the control group. Cued recall revealed that 9% of the sample had only seen the intervention newsletter, 4% only social media posts and 7% had seen both, whereas 80% had not seen any of the intervention tools.

The post-intervention survey (T2) contained the same questions as T1 except for shopping behaviour and additional questions about environmental concern, time spent online and socio-demographic variables. Only subjects in the experimental group were asked about their attitude towards the theme week and sender. The third survey (T3) was conducted four weeks after the intervention to assess behavioural impacts. This time, participants were again questioned about the self-reported number of new products and second-hand clothing purchased in the last four weeks.

2.2.4. Measures

All measures can be found in Appendix A. If not specified otherwise, items were assessed on a 5-point Likert scale, with the option 'I don't know', which was defined as a missing variable in subsequent analyses.

Sufficiency behaviour was operationalised as a low consumption level of clothing. This was assessed at T1 and T3. We asked for the amount of clothes obtained in local or secondhand-shops, clothes swapped or gifted, clothes bought online, online-reselling or online-exchange of clothing, and for the amount of self-made clothes, each on a scale from '0 pieces of clothing' to '6 or more pieces' during the last four weeks.

Personal norm for sufficiency consisted of three items ($\alpha_{T1} = 0.78$, $\alpha_{T2} = 0.78$) and were constructed following Schwartz (1977), e.g. 'I feel obliged only to buy new clothes when I really need them'.

Social norm for sufficiency was assessed as the perceived descriptive

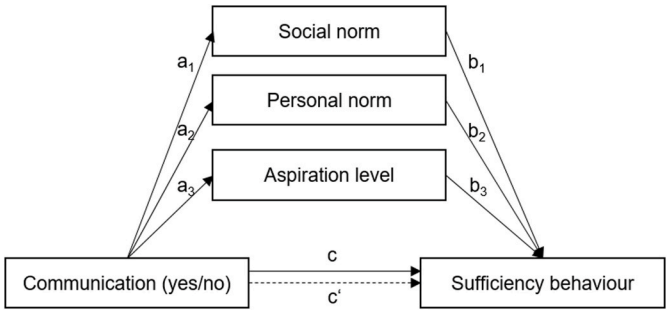

Fig. 1. Hypotheses for study 1 (H1a: c; H2a: a_1b_1; H3a: a_2b_2; H4a: a_3b_3).

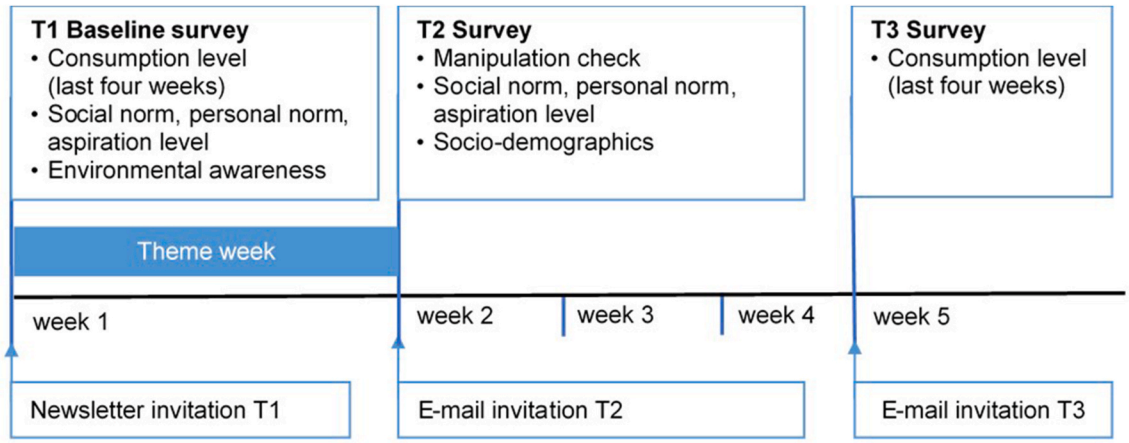

Fig. 2. Procedure study 1.

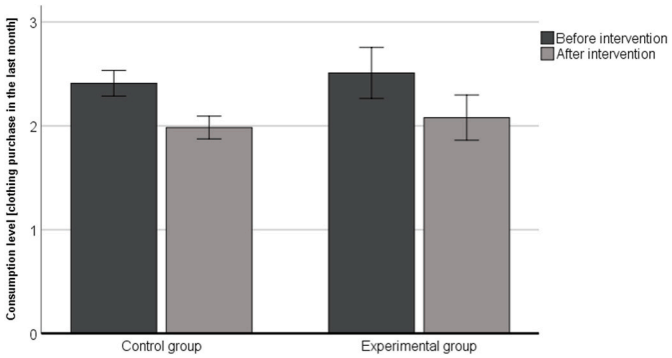

Fig. 3. Clothing consumption level in the last month before (black) and a month after (grey) the theme week intervention. Error bars indicate 95% confidence intervals.

social norms (Cialdini et al., 1991) of customers of the sustainable online shop as the peer group. Five items assess whether participants think other customers show sufficiency behaviour, e.g. 'customers of the online shop buy new clothes if they really need them' (−), $\alpha_{T1} = 0.78$, $\alpha_{T2} = 0.79$.

Aspiration level of clothing was assessed by the mean of the subjectively ideal level of clothing consumption (‚Given limitless availability of money and time, how many pieces of clothing (outerwear) would you ideally like to buy annually?'; Frick et al., 2021), and the subjectively sufficient level of clothing consumption ('How many pieces of clothing would you need to buy annually for your well-being not to be restricted?'; Jenny, 2016) ($r_{T1} = 0.63$, $p < .001$, $r_{T2} = 0.62$, $p < .001$).

Environmental awareness was assessed by using a short version of the German environmental awareness scale (Geiger, 2019) including 9 items, $\alpha = 0.66$. The option 'I don't know' was also included and later defined as missing value in subsequent analyses.

Socio-demographics were gender, age, education level, and income level.

2.3. Statistical analysis

To test hypothesis 1a, repeated-measure variance analysis was applied. The interval-scaled variables measuring the aspiration level were tested for outliers. Outliers were identified, as proposed by Tabachnick and Fidell (2013), as values scoring higher than 3.29 standard deviations above the sample mean. They were truncated, i.e. recoded to scores one unit above the highest value within the described range. Missing data resulted in a decrease of the sample through listwise deletion.

Mediation analyses to test hypotheses 2a-4a and the pretest-posttest control group design from Valente and MacKinnon (2017) was applied (see Fig. 4). This method adjusts for pretest scores and thus controls for confounders invariant over time. Path analyses with manifest variables were executed with R lavaan (Rosseel, 2012), using robust maximum likelihood. In order to handle missing data, we used full information maximum likelihood (Graham, 2009; Steinmetz, 2015).

2.4. Results

All measured variables are listed in Table 2. To check whether randomisation led to comparable groups, we tested differences in all study variables before intervention (T1) via multiple variance analysis (MANOVA). We found no significant differences between experimental and control groups, except for social norm for sufficiency, which was higher in the experimental group, $F(1) = 23.63$, $p < .001$, partial $\varepsilon^2 = 0.015$.

Repeated-measure variance analysis showed that consumption levels dropped in both the experimental and control groups from pre-to post-intervention measurement, $F(1, 2111) = 25.94$, $p < .001$, $\varepsilon = .012$. There was no main effect of the group, $F(1) = 0.91$, $p = .34$. Yet the experimental group did not differ from the control group in their consumption reduction, $F(1, 2111) < 0.01$, $p = .98$. The intervention therefore did not make a difference in participants' clothing consumption, but all participants reduced their clothing consumption.

Addressing H2a-H4a, we examined whether an influence of the intervention on the consumption level was mediated by motive changes. As Table 3 shows, the intervention had a small effect on the perceived descriptive social norm for sufficiency with regards to other customers

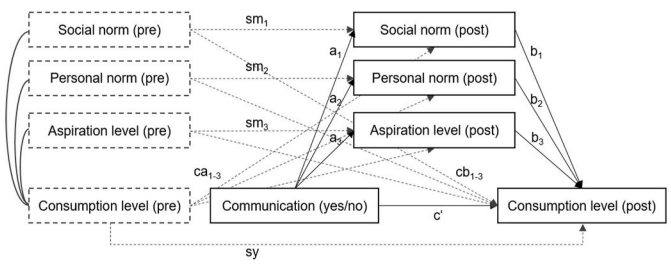

Fig. 4. Mediation model of consumption reduction after Valente and MacKinnon (2017). Model includes the effects of intervention on mediators (a), effects of mediators on outcome (b), effect of intervention on outcome (c'), stability of mediators (sm) and stability of dependent variable (sy), cross-lagged effects on mediators (ca), cross-lagged effects on outcome (cb), and the pretest correlations between mediators and outcome.

Table 2
Descriptive statistics of study 1.

	Control group (n = 1685)				Experimental group (n = 428)			
	T1		T2		T1		T2	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Dependent variable								
Consumption level	2.41	2.58	1.98	2.29	2.51	2.60	2.08	2.34
Mediators								
Aspiration level	13.16	7.90	13.00	7.82	13.22	7.43	13.34	7.86
Personal norm	3.70	0.82	3.84	0.79	3.79	0.78	3.94	0.76
Social norm	3.41	0.59	3.46	0.59	3.58	0.55	3.63	0.53

Notes. Social norm: CG T1 n = 1390, T2 n = 1319; EG T1 n = 390, T2 n = 386.

Table 3
Mediation model predicting consumption reduction.

		b	*se*	*β*	*z*	*p*
Path						
	a1	0.08	0.03	.06*	3.25	<.01
	a2	0.05	0.03	.03	1.75	.08
	a3	0.22	0.29	.01	0.76	.45
	b1	−0.05	0.13	-.01	−0.37	.71
	b2	−0.13	0.09	-.04	−1.34	.18
	b3	0.03	0.01	.10*	2.64	.01
	c'	0.09	0.12	.02	0.74	.46
Stability						
	sm1	0.61	0.02	.61*	26.15	<.01
	sm2	0.67	0.02	.70*	40.28	<.01
	sm3	0.90	0.02	.79*	44.09	<.01
	sy	0.13	0.02	.14*	5.43	<.01
Cross-lagged effects						
	ca1	−0.01	0.00	-.03	−1.43	.15
	ca2	−0.01	0.01	-.05*	−2.71	.01
	cb3	0.10	0.05	.03	1.94	.05
	cb1	0.15	0.11	.04	1.31	.19
	cb2	−0.25	0.09	-.09*	−2.77	.01
	cb3	0.01	0.01	.04	1.01	.31
Covariates						
Consumption (pre) – social norm (pre)		0.04	0.03	.03	1.08	.28
Consumption (pre) – pers. norm (pre)		−0.21	0.05	-.10*	−4.19	<.01
Consumption (pre) – aspiration l. (pre)		3.67	0.49	.18*	7.43	<.01
Indirect mediation effects						
Social norm (H2)		0.00	0.01	.00	−0.37	.71
Personal norm (H3)		−0.01	0.01	.00	−1.05	.30
Aspiration level (H4)		0.01	0.01	.00	0.74	.46

Notes. SEM fit indices: $\chi^2(16) = 463.87$, CFI = 0.90, RMSEA = 0.12, SMSR = 0.11.

(path a_1), yet this social norm had no effect on the consumption level of clothing (path b_1). The consumption level after the intervention was influenced by the aspiration level (path b_3). Yet the intervention had no effects on personal norm or aspiration level, and mediation effects turned out to be non-significant. It is noteworthy that although mediators were stable over time (stability $sm_{1\text{-}3}$), the consumption level of clothing before and after the intervention only showed a weak positive relationship (stability sy).

2.5. Discussion

All participants had reduced their clothing consumption and thus increased their sufficiency behaviour, whether they had perceived the intervention or not. Limitations of our study design are, of course, a prerequisite for interpreting these findings and are discussed below. However, our result replicates findings from a similar field experiment in the social media, which aimed at reducing food waste (Young et al., 2017) and showed that both social media and control groups significantly reduced their self-reported food waste. We conclude that the questionnaire may itself have had an effect as participants reflected on their clothing consumption during the pre-test questionnaire: It has been shown that assessing consumption intentions alone may alter subsequent behaviour, at least in the short term (mere-measurement effect, Morwitz & Fitzsimons, 2004). A second explanation for the overall consumption reduction may be the point of time in a clothing consumption cycle. When participants first completed the questionnaire, they may merely have been interacting with the online shop (irrespective of their perception of the intervention), and thus were more likely to have bought clothes whereas, a month later, they may not have been in a 'consumption phase'. Also, clothing consumption is undertaken infrequently, leading to a high error variance in the outcome variable and thus possibly weakening effects. The low stability of clothing consumption in the four weeks prior to intervention, compared to the four weeks after intervention, supports this explanatory approach. Third, participants from the control group could have been unconsciously exposed to the campaign and therefore, both groups would have been affected by the treatment. Yet this explanation seems unlikely, as informational strategies change motives or knowledge, which involves conscious reflection (as opposed to structural strategies which do not need reflection, e.g., Steg & Vlek, 2009).

Mediation analysis showed no mediation effects. The intervention had a small effect on the social norm of other customers' clothing sufficiency, but that did not affect consumption. From the mediators, only the aspiration level influenced the consumption level, yet the change of aspiration levels before and after the intervention could not predict the change in consumption levels. In any case, the non-significant results and low visibility of the theme week show that, in the way we implemented the intervention, single posts were not influential enough to have a measurable effect. The reason for this insignificance may be found in deficiencies of our study design, as discussed below, but also in low attention levels on social media and the sheer amount of competing information available online (Maurer & Wiegmann, 2011). Therefore, social media communication might be too weak when it appears as singular posts in participants' newsfeeds.

The transdisciplinary approach and the field setting were additional challenges, which resulted in a dependency on the interests and technical availabilities of the cooperating online shop (e.g., they formulated the daily posts on their own), giving us less control regarding the intervention's topic and wording. Focussing on the hashtag #lessismore and on 'favourite pieces' within the theme week may not be explicit enough to foster sufficiency behaviour. Also, only 21% of participants perceived the theme week communication activities. Another recent study showed that reminding individuals about the environmental consequences of their purchases can effectively increase voluntary simplicity (Peifer et al., 2020). Thus, it seems advisable to educate individuals on the link between overconsumption and the ecological harnesses of fast fashion before they indicate their purchase intentions.

Whereas the study's strength lies in its sample size and external validity, another methodological limitation is its quasi-experimental approach. Assigning participants post-hoc to experimental and control groups resulted in selection effects. The groups were inherently different in terms of their initial consumption level, social media use, and sociodemographic characteristics. Also, we could not completely rule out

that drop-outs between T1 and T3 (36%) were selective, even if there is no strong rationale for this. Finally, the sample was not representative of the German population. Participants were recruited among customers of a sustainable online shop, which attracted participants with higher-than-average education levels, environmental concern, and female gender, as was also found in other convenience sample studies on consumption reduction (Herziger et al., 2020; Joanes et al., 2020). Recruiting participants through a newsletter may have excluded potential participants who are irregular customers not as tied to the company or not interested in frequent information.

As a practical research implication, the study demonstrates how effectiveness of interventions has to be interpreted with caution and within the limitations of the study design. Despite methodological weaknesses, the field experiment indicates positive effects of sufficiency-promoting communication on clothing sufficiency and provides valuable practical implications. To address these potentials, a laboratory experiment was conducted to follow up on open questions.

3. Study 2: Online laboratory experiment

3.1. Hypotheses

In Study 2, we tested further hypotheses we had derived from the literature, while we could also retest the hypotheses from Study 1. We compared sufficiency-promoting and consumption-promoting communication with a neutral communication condition that does not suggest any change in the recipient's consumption levels, expecting inverse effects on sufficiency behaviour by consumption-promotion. Further, the aspiration level, personal norm and social norm for sufficiency were also expected to mediate this relationship analogous to H2a-H4a (Fig. 1).

H1b. Consumption-promoting communication decreases sufficiency behaviour compared to a neutral communication condition.

H2b, H3b, H4b. The perceived descriptive social norm, personal norm and aspiration level mediate the negative impact of consumption-promoting communication on sufficiency behaviour.

In the laboratory setting, the impact of peer endorsement of communication conditions through likes and comments could be controlled for and tested. Each communication condition was presented either with or without peer endorsement. We hypothesised that peer endorsement of social media communication increases its effectiveness, proposing a moderating effect on the impact of communication conditions on sufficiency behaviour (Fig. 5). Note that most above cited literature detected effects for peer groups that participants knew in person. In our research, we focus on social media communication from organisations and therefore test whether descriptive social norms shown by the more distal peer group of other social media users are equally effective.

H5a, H5b. Peer endorsement moderates the positive impact of sufficiency-promoting communication on sufficiency behaviour (a) and the negative impact of consumption-promoting communication on sufficiency behaviour (b).

Since in Study 1 we examined only customers of a sustainable online shop who reported high environmental awareness, in Study 2 we controlled for such values in a representative sample. Numerous studies established that pre-existing values of self-transcendence and self-enhancement influence pro-environmental behaviour and curtailment (Steg et al., 2012; Steg et al., 2014; for sustainable clothing consumption see; Geiger & Keller, 2018). We expected that participants with high self-transcendence values (biospheric and altruistic values) would show more sufficiency behaviour, and the opposite for high self-enhancement values (hedonistic and egoistic values).

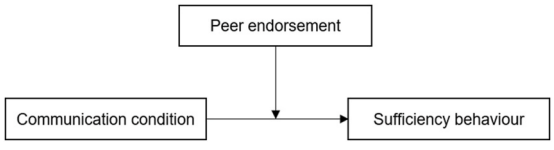

Fig. 5. Moderation effect of peer endorsement by social media users.

H6. Individuals with high self-transcendence values show more sufficiency behaviour, whereas individuals with high self-enhancement values show less sufficiency behaviour.

Due to the novelty of sufficiency-promoting communication, there is still little practical experience and empirical evidence on its effects on the image and value of the company. In past research, sufficiency-promoting communication itself was found to contribute to a positive attitude towards the company (Armstrong Soule & Reich, 2015; Gossen & Frick, 2018; Ramirez et al., 2017). Therefore, we expect that the attitude towards sufficiency-promoting communication and towards the sender are more positive than in the other conditions.

H7a, H7b. Sufficiency-promoting communication leads to a more positive attitude towards the communication and sender than neutral communication (a) and consumption-promoting communication (b).

3.2. Method

Study 2 was conducted as an online laboratory experiment, allowing for a representative sample and full randomisation. The participants were randomly assigned to one of six conditions in a 3 × 2 design, with the three communication conditions (neutral, sufficiency-promoting and consumption-promoting), each paired with only the fictional company's communication (Instagram posts) or the communication plus peer endorsement (Instagram posts with likes and comments).

3.2.1. Pre-study for the design of experimental material

In order to identify the most effective manipulation for the actual laboratory experiment, we conducted a pre-study. Initially, seven posts were designed (in each of the three versions neutral, sufficiency-promoting and consumption-promoting, but not including peer endorsement). In three surveys with mixed posts, $N = 105$ could rate the posts on two dimensions. First, participants' attitude towards the communication was assessed, and second, the participants rated the post on a consumption promotion scale from 1 = 'the post is intended to make me consume less', to 3 = 'neither', to 5 = 'the post is intended to make me consume more'. Based on these indicators, four posts were selected for the experiment. They were selected on the basis of the sufficiency-promoting version scoring as low as possible, the consumption-promoting version scoring as high as possible and the neutral version scoring in the middle range of the consumption promotion scale. At the same time, the posts with an overall positive attitude were chosen. The consumption promotion in the sufficiency-promoting condition was perceived as $M(SD) = 1.99(0.96)$, so on the side of 'intended to make me consume less', the mean in the consumption-promoting condition was $M(SD) = 4.16(0.82)$, 'intended to make me consume more', and in the neutral condition it was $M(SD) = 3.40(0.76)$. The sufficiency-promoting communication included both messages directed towards normative motives (as proposed by Joanes et al., 2020) and hedonic motives (egoistic appeals, as proposed by Herziger et al., 2020) to engage in sufficiency behaviour. The messages thus included both ecological and personal advantages of sufficiency.

3.2.2. Sample

The data was collected by a market research institute within its online access panel, recruiting participants from Germany. As an inclusion criterion, participants were screened for social media use (Facebook, Instagram or Twitter). Only participants who used it at least once a week were included. To provide representativeness, a socio-demographic

distribution was chosen that is representative for the part of the German population who actively participate on social media. Therefore, participants were screened on the criteria of age (three age groups between 16 and 69 years), gender (two groups), education level (three levels) and income (two levels). The planned sample was $N = 1100$, as power analysis using G*Power proposes a sample size of 1093 participants for a medium effect size of 0.15, given $\alpha = 0.05$ and Power = 0.95. $N = 2286$ people accessed the survey, $N = 815$ were excluded as they did not use social media regularly, $N = 222$ because they did not pass a control question ('please click 2 here'), $N = 13$ due to a break of more than 15 min within the questionnaire (as the priming effect of seeing the posts would fade over time), and $N = 259$ participants did not pass the manipulation check explained below. From the remaining $N = 977$ participants, $N = 96$ did not want to participate in the coupon raffle. The groups in the six conditions did not differ significantly in age, $F(5) = 1.02$, $p = .41$, gender, $\chi^2(15) = 13.00$, $p = .60$, income, $F(5) = 0.76$, $p = .58$, education level, $\chi^2(10) = 10.44$, $p = .40$, or the time spent online, $F(5) = 1.36$, $p = .24$. The final sample of $N = 881$ is described in Table 4.

3.2.3. Material

The manipulation comprises six communication conditions, each consisting of four Instagram posts of a fictional online clothing shop. Over the conditions, each post had an identical design, using the same picture and text design, and in the peer endorsement condition, also the same number of likes and comments. For an example of a post in the three communication versions see Fig. 6. For full manipulation display, see supplementary material.

3.2.4. Procedure

After entering the survey, a screening question covered the social media use in terms of frequency and general internet use in terms of time expenditure. Next, participants were asked for their age, education level, income level and gender, in order to screen for quotas that ensure a representative sample for the German population actively participating on social media in all six conditions. This was followed by random assignment to one of the six communication conditions and a presentation of the intervention, consisting of four Instagram posts (for an example see Fig. 6). Participants were asked to look at the posts for a given time and like and comment on them. Each post was shown for at least 8 s, and the median time that participants spent looking at each of the four posts was between 15 and 21 s. After manipulation, dependent variables were assessed (see next chapter).

3.2.5. Measures

All measures can be found in Appendix A. If not otherwise specified, items were assessed on a 5-point Likert scale, with the option 'I don't know', which was defined as a missing variable in subsequent analyses.

Sufficiency behaviour in the domain of clothing was measured by a coupon choice. In a coupon raffle for 10 vouchers at 10 Euros each, participants could choose between four coupons: two options for popular retail shops representing a consumption-oriented choice, and two options representing sufficiency behaviour, namely a voucher for a second-hand online shop, or a donation of the given amount to a NGO that campaigns for sustainable clothing consumption. The option 'I do not want to take part in this raffle' was defined as a missing variable. To determine sufficiency behaviour as a dichotomous variable, voucher choices for the charity donation and second-hand online shop were coded as 1 = yes, and the regular online-shop vouchers were coded as 0 = no.

Aspiration level of clothing see study 1.

Personal norm for sufficiency see study 1.

Social norm for sufficiency was assessed using a set of eight items, on the descriptive social norm of the peer group for sufficiency (e.g. reduced consumption, repair, sharing), that varied slightly from study 1, this time defined as 'Instagram users', $\alpha = 0.82$.

Attitude towards sufficiency-promoting communication was measured with five new items assessing how users liked the posts ($\alpha = 0.77$), e.g. 'The social media presence of the clothing company is appealing'.

Attitude towards the sender measured how participants perceived the online shop due to its communication. The scale 'motives of the sender' was used (Armstrong Soule & Reich, 2015). In it, the altruistic dimension, and reversed strategic and exploitive motives were integrated ($\alpha = 0.77$). Each dimension consists of three items. 'Tries to address new customers' or 'does not really care for the environment' are examples for motives of the sender.

Universal values was assessed using a short version of Schwartz's value scale (Steg et al., 2012) to measure altruistic and biospheric values in the category of self-transcendence, $\alpha = 0.88$, and egoistic and hedonistic values in the category of self-enhancement, $\alpha = 0.77$, with eight items ranging from −1 'opposed to my values', 0 'unimportant' to 7 'guiding principle'.

M***anipulation check***. To check whether participants received and understood the communication content, they were shown one of the four social media posts in all three communication versions (i.e., neutral, consumption-promoting, sufficiency-promoting), as well as the option 'I did not see any of these posts' and were instructed to pick which one of them was presented to them.

Socio-demographics. We assessed the socio-demographic variables gender, age, education level, income level and time spent online.

3.3. Statistical analysis

To test the hypotheses of sufficiency-promoting communication or consumption-promoting communication (H1), their interaction with peer endorsement on sufficiency behaviour (H5), as well as the covariates of universal values (H6), stepwise hierarchical logistic regression was applied, as this allowed us to measure both the direct effect of sufficiency communication, as well as how this effect changes when other predictors are included and allowed to interact with the manipulation (Field, 2009). The impact on the attitude towards the message and the sender (H7) was computed with variance analysis (ANOVAs). These analyses are computed in SPSS 25. Mediation analyses, including sufficiency-promoting communication (H2a-H4a) and consumption-promoting communication (H2b-H4b), were tested against the neutral condition in two separate models, each with a mediation analysis applying diagonal weighed least squared estimator (DWLS) in R lavaan (Rosseel, 2012; Steinmetz, 2015).

3.4. Results

Outcome and mediator variables are shown in Table 5. Sufficiency behaviour as coupon choice was rather rare, with 18.3% of participants choosing to donate their prize to an NGO for sustainable clothing, and 9.2% choosing the coupon for an online peer-to-peer second-hand

Table 4
Sample description.

	Laboratory experiment	German Population
	Full sample	
	$N = 881$	(Destatis, 2018)
Age *M* (*SD*)	33.7 (13.4)	44.3
Education level*	52.2% secondary	30.4% secondary
	26.1% undergrad.	23.1% undergrad.
	18.9% graduate	31.9% graduate
Income *M(SD)*	1500 - 2000 €	1′957 € (in 2013)
Gender*	51.2% female	50.7% female
	48.6% male	49.3% male
Online h/day *M(SD)*	3.82 (2.08)	3.27

Notes. Percentages not adding up to 100% are due to participants choosing "other" or "no indication".

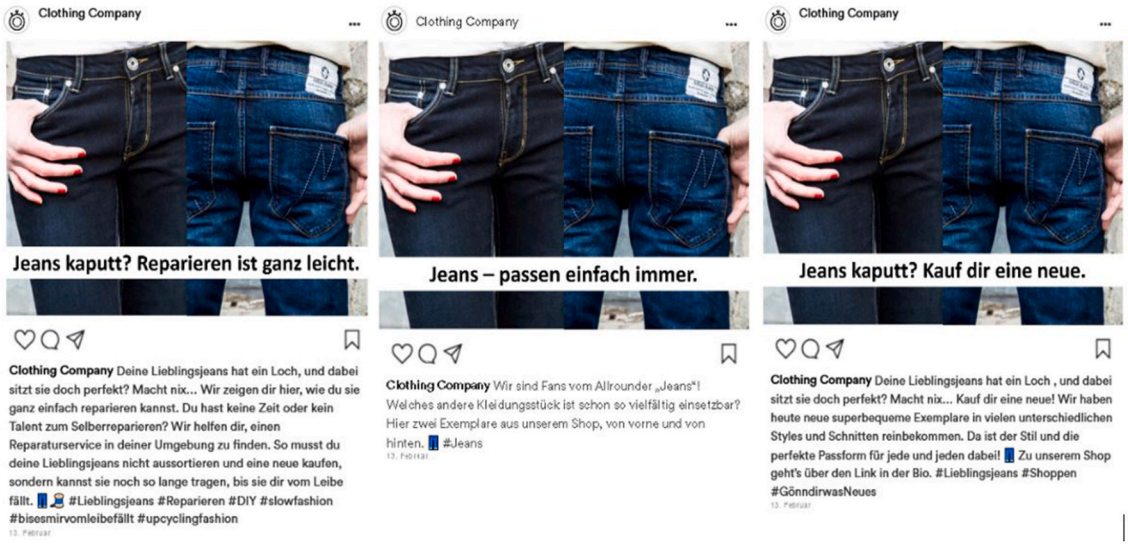

Fig. 6. Manipulation from left to right: (1) Sufficiency-promoting communication: 'Torn jeans? It's easy to repair them.', (2) Neutral communication: 'Jeans - they always fit.', (3) Consumption-promoting communication 'Torn jeans? Buy a new pair.'.

Table 5
Descriptive variables.

	Consumption promotion				Neutral condition				Sufficiency promotion			
	Peer endorsement:				Peer endorsement:				Peer endorsement:			
	without		with		without		with		without		with	
	$N = 129$		$N = 145$		$N = 154$		N = 146		$N = 162$		$N = 145$	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Sufficiency behaviour*	24.03%		20.00%		25.97%		25.34%		33.95%		34.48%	
Ideal level of consumption	38.48	36.8	36.46	33.84	33.44	29.58	43.02	35.02	22.64	26.19	23.26	27.26
Sufficient level of consumption	9.51	12.27	10.10	14.62	8.88	12.05	11.91	13.84	5.75	10.53	6.52	9.14
Aspiration level	24.00	22.18	23.28	21.57	21.16	18.97	27.47	21.9	14.20	16.55	14.89	16.42
Personal norm	3.21	1.12	3.19	1.13	3.17	1.04	2.99	1.11	3.33	1.03	3.45	1.04
Social norm**	2.21	0.72	2.16	0.56	2.21	0.64	2.23	0.68	2.24	0.74	2.30	0.81
Attitude towards communication	3.14	0.82	3.32	0.84	3.24	0.86	3.16	0.83	3.77	0.81	3.73	0.78
Attitude towards sender	2.49	0.48	2.52	0.48	2.66	0.49	2.69	0.45	3.25	0.59	3.23	0.64
Self-transcendence	5.18	1.21	5.13	1.09	5.32	1.15	5.2	1.05	5.23	1.23	5.08	1.10
Self-enhancement	3.68	1.11	3.57	1.08	3.52	1.19	3.5	1.12	3.37	1.16	3.57	1.01

Notes.
* Dichotomous variable: percentage of participants showing sufficiency behaviour.
** *N* in the above order: 121, 134, 140, 136, 150, 135 (due to option: 'I don't know').

Table 6
Hierarchical logistic regression model predicting sufficiency behaviour.

		b	*se*	*Wald*	*df*	*p*	*odds ratio*	*Lower 95% CI*	*Upper 95% CI*
Step 1	Communication condition			11.62	2	.003			
	Sufficiency promotion	0.41	0.18	5.24	1	.022	1.51*	1.06	2.14
	Consumption promotion	−0.21	0.20	1.12	1	.290	0.81	0.55	1.19
Step 2	Communication condition			10.75	2	.005			
	Sufficiency promotion	0.42	0.18	5.49	1	.019	1.53	1.07	2.18
	Consumption promotion	−0.16	0.20	0.69	1	.408	0.85	0.57	1.25
	Self-transcendence	0.18	0.07	6.86	1	.009	1.20	1.05	1.37
	Self-enhancement	−0.21	0.07	8.80	1	.003	0.81	0.71	0.93
Step 3	Communication condition			4.68	2	.097			
	Sufficiency promotion	−1.94	0.90	4.64	1	.031	0.14	0.02	0.84
	Consumption promotion	−0.82	0.94	0.76	1	.385	0.44	0.07	2.79
	Self-transcendence	−0.03	0.12	0.05	1	.823	0.97	0.77	1.23
	Self-enhancement	−0.20	0.07	7.81	1	.005	0.82*	0.72	0.94
	Interaction communication * self-transcendence			7.64	2	.022			
	Sufficiency * self-transcendence	0.45	0.17	7.16	1	.007	1.56*	1.13	2.16
	Consumption * self-transcendence	0.12	0.18	0.48	1	.490	1.13	0.80	1.60

$R_2 = 0.04$ (Cox–Snell); 0.06 (Nagelkerke). Model $\chi 2(6) = 35.53$, $p < .001$.

marketplace, whereas the other 72.5% chose one of the two clothing shop coupons.

The influence of communication condition, peer endorsement and values as covariates on sufficiency behaviour was assessed by hierarchical logistic regression (Table 6). Hypothesis 1a was confirmed at Step 1, not including covariates. If participants were presented the sufficiency-promoting communication, they were 1.51 [95% CI 1.06–2.14] times as likely to choose the sufficiency coupon as participants in the neutral condition. Further analyses revealed that this effect was explained by participants with high self-transcendence values, shown in the interaction effect of self-transcendence and sufficiency promotion (Step 3). Additionally, high self-enhancement values decreased sufficiency behaviour. The participants who saw consumption-promoting communication did not choose the sufficiency option less often than those in the neutral condition (H1b). The stepwise procedure produced the best model fit ($\chi^2(6) = 35.52$, $p < .001$) for the model seen in Table 6 that excluded peer endorsement (Block χ^2 (1) = 0.18, $p = .67$), the interaction effect between communication conditions and peer endorsement (H5, Block $\chi^2 = 0.49$, $p = .78$), and the interaction effect between communication conditions and self-enhancement (Block χ^2 (2) = 1.11, $p = .57$), which had no effect on sufficiency behaviour.

The mediation model of sufficiency-promoting communication compared to the neutral condition on sufficiency behaviour (H2a – H4a), revealed that effects from sufficiency-promoting communication on sufficiency behaviour were mediated by a lower aspiration level for clothing (Table 7, Fig. 3). Sufficiency communication also influenced the personal norm for sufficiency (path a_2, $\beta = .13$), but this did not translate into more sufficiency behaviour (path b, *n.s.*). The personal norm and aspiration levels were negatively correlated, $\beta = .43$. No mediation effect could be found for the social norm of other social media users. Since logistic regression analysis had shown that consumption-promoting communication had no significant effect on sufficiency behaviour, the mediation model for consumption-promoting communication was equally non-significant (H2-4b), and can be found in Appendix B.

Finally, we addressed the attitude towards sufficiency-promoting communication and its sender. As hypothesised (H7), there was a significant main effect of the communication condition on the attitude towards the communication $F(2) = 42.20$, $p < .001$, *partial* $\varepsilon^2 = .09$. Contrasts revealed that the attitude towards the sender of sufficiency-promoting communication was more positive than to senders of both neutral communication, $b(SE) = 0.57$ (0.10), $t = 5.91$, $p < .001$, *partial* $\varepsilon^2 = .04$ and consumption-promoting communication, $b(SE) = 0.41$ (0.10), $t = 4.21$, $p < .001$, *partial* $\varepsilon^2 = .02$. Peer endorsement $F(1) = 0.12$, $p = .724$, and its interaction with communication, $F(2) = 2.15$, $p = .112$, did not have a significant effect. Accordingly, there was a significant main effect of the communication on the attitude towards the sender, $F(2) = 154.92$, $p < .001$, *partial* $\varepsilon^2 = .26$. Contrasts revealed that the attitude towards the sender in the sufficiency-promoting condition was more positive than both the neutral condition, $b(SE) = 0.54$ (0.06), $t = 8.64$, $p < .001$, *partial* $\varepsilon^2 = .08$ and consumption-promoting condition, $b(SE) = 0.71$ (0.06), $t = 11.44$, $p < .001$, *partial* $\varepsilon^2 = .13$. However, in this model too, neither peer endorsement $F(1) = 0.14$, $p = .709$, nor its interaction with communication, $F(2) = 0.21$, $p = .812$, had a significant effect.

Table 7
Mediation model of sufficiency-promoting communication (following Fig. 1).

	b	*se*	*β*	*z*	*p*
Path					
a1	0.05	0.06	.04	0.82	.415
a2	0.27	0.09	.13*	3.08	.002
a3	−9.60	1.71	-.25*	−5.63	<.001
b1	−0.10	0.08	-.07	−1.26	.207
b2	0.11	0.06	.11	1.84	.066
b3	−0.01	0.00	-.24*	−3.86	<.001
c	0.13	0.11	.07	1.17	.241
Indirect mediation effects					
Social norm	0.00	0.01	.00	−0.69	.493
Personal norm	0.03	0.02	.01	1.59	.112
Aspiration level	0.12	0.04	.06*	3.13	.002
Total effect	0.28	0.11	.14*	2.49	.013
Covariates					
Social norm - personal norm	0.05	0.03	.06	1.62	.106
Social norm - aspiration level	−1.19	0.63	-.09	−1.90	.058
Personal norm - aspiration level	−8.55	1.01	-.43*	−8.44	<.001

3.5. Discussion

Compared to the other conditions, sufficiency-promoting social media communication led to more sufficiency behaviour and a better attitude towards the communication content and towards the company. Including values into the regression model revealed that sufficiency communication was mainly effective for participants scoring high on self-transcendence values. Mediation analyses further showed that, as a short-term effect, a higher aspiration level mediates the relationship between sufficiency-promoting communication and sufficiency coupon choice. Promoting sufficiency had a positive effect on the personal norm for sufficiency, yet this effect seemed to be too weak to translate into actual behaviour (this is also given for Study 1). This result is in line with an earlier study that found this lack of connection between personal norm and behaviour (Frick et al., 2021). An alternative explanation would be that the effect of personal norm is mediated through a lower aspiration level. Consumption-promoting communication, however, did not lead to less sufficiency behaviour compared to the neutral condition. This finding contrasts with past research showing the consumption-increasing effects of advertisement (e.g., Hoch et al., 2016; Kasser & Kanner, 2004). Possibly, the neutral condition of the fictional company's communication was not perceived as completely neutral but may be perceived as advertising of some sort since individuals expect companies' primary marketing goals to be consumption promotion (Stoeckl & Luedicke, 2015). Another possibility to explain this lack of difference is that, as consumption-promoting communication predominates in online environments, a habituation effect might be occurring whereby one consumption-promoting post does not make a difference, but sufficiency-promoting communication attracts more attention due to its novel character (Gossen et al., 2019).

Compared to the other conditions, sufficiency-promoting communication also positively affected attitudes towards the communication and sender whereas consumption-promoting communication did not cause a change in these attitudes. This finding is in line with previous research on institutional sufficiency-promoting marketing, which found that a message amplifying sufficiency behaviour boosts favourable attitudes towards green demarketing advertising (Reich & Armstrong Soule, 2016) and enhances customers' perceptions of the firm (Ramirez et al., 2017). Consumption-promoting communication may not have an effect compared to a neutral condition due the fact that advertising is so common that it is not actively processed. This effect may also have influenced perceptions of the fictional company in our laboratory experiment.

Peer endorsement did not moderate the relationship between communication and any of the dependent variables. One reason for this might be that the fictional posts and comments were perceived as 'fake'. For that matter, also the laboratory setting of the study lacks external validity because the posts were isolated and not presented in a newsfeed along with other posts, as is common on Instagram. This isolation resulted in less distraction than in a real-world setting. Most previous studies that have found effects of social norms included social information from real peers that participants actually knew. The study at hand, conversely, showed comments and likes of other social media users that participants did not personally know. Social norms of the more distant peer group of social media users are thus not as effective as social norms transported by close peers.

4. General discussion

We find that sufficiency-promoting communication in social media can be effective for enhancing sufficiency behaviour and attitudes in the short term. Table 8 provides an overview of hypotheses and respective results. In the field experiment, all participants reduced their level of clothing consumption regardless of whether or not they had seen the intervention. Therefore, either the engagement with the questionnaire itself (especially among individuals with a high interest in sustainability) could have evoked behaviour change towards sufficiency or participants were in different consumption cycle stages. Despite these shortcomings, the study shows the practical limitations of social media when it comes to behaviour change. Compensating the methodological weaknesses of the field experiment, the laboratory experiment showed significant short-term effects of sufficiency-promoting communication on sufficiency behaviour and attitudes towards the communication and its sender. With the sufficiency-promoting communication, participants were 1.5 times more likely to choose a sufficiency-oriented coupon and rated the communication and its sender more positively than under the neutral condition. Interestingly, this effect was apparent mainly for participants with high self-transcendence values, meaning that the intervention was most effective for target groups already engaged in the topic.

The effects of universal self-transcendence and self-enhancement values (e.g., Geiger & Keller, 2018) could be replicated for sufficiency behaviour in the clothing domain: whereas a strong emphasis on self-enhancement consistently decreased sufficiency choice, self-transcendence interacted with the sufficiency communication. Although the effect size was relatively small, it is still worth noting that the short-term effect of sufficiency-promoting communication was as influential as self-transcendence or self-enhancement. From this finding, we draw two conclusions. First, the short-term effects may best unleash their potential when the intervention is timed shortly before a relevant consumption decision (e.g., before customers of an online shop move to the cashier). As a practical implication, sufficiency-promoting communication would be valuable as a sufficiency nudge (Thaler & Sunstein, 2008). Second, as we only found short-term effects; long-term effects remain to be tested in future research. Although, in our study, single social media posts were too weak as an intervention (as was also found by Young et al., 2017), it remains to be explored in greater depth whether, for example, a more repeated exposure to sufficiency cues from several sources or incorporating social norms from direct peers (as in Bond et al., 2012) has an effect.

Table 8
Overview of hypotheses and results.

		Study 1	Study 2
H1a	Sufficiency-promoting communication increases sufficiency behaviour compared to a neutral communication condition.	no	yes
H2a	The perceived descriptive social norm mediates the positive impact of sufficiency-promoting communication on sufficiency behaviour.	no (only path a)	no
H3a	The personal norm for sufficiency mediates the positive impact of sufficiency-promoting communication on sufficiency behaviour.	no	only path a
H4a	A decrease of the aspiration level for clothing mediates the positive impact of sufficiency-promoting communication on sufficiency behaviour.	no (only path b)	yes
H5a	Peer endorsement moderates the positive impact of sufficiency-promoting communication on sufficiency behaviour.	–	no
H1b-5b	Effects for consumption-promoting communication	–	no
H6	Individuals with high self-transcendence values show more sufficiency behaviour whereas individuals with high self-enhancement values show less sufficiency behaviour	–	yes
H7a, b	Sufficiency-promoting communication leads to a more positive attitude towards the communication and sender than neutral communication (a) and consumption-promoting communication (b).	–	yes

The laboratory Study 2 showed a mediation effect: Sufficiency-promoting communication changes the self-reported aspiration level in the short-term, which then influences sufficiency behaviour. In the field experiment, the relationship between the aspiration and consumption level was also present. Yet, no changes could be detected for the mediator social norm for sufficiency in either study, and only a tendency for the personal norm as a mediator for sufficiency was found in Study 2. The interventions in both studies included sufficiency-promoting messages addressing normative motives (Joanes et al., 2020) and hedonistic motives (Herziger et al., 2020). Apparently, these messages had an effect only in the laboratory setting. The sufficiency-promoting communication may have activated normative motives, as suggested in previous research, which found that activating normative goals weakens hedonistic consumption motives (Maio et al., 2009). Also, finding the aspiration level to be a strong mediator shows how environmental psychology could enable more knowledge on behavioural determinants to be gained by examining factors of unsustainable behaviour (Thøgersen, 2014). Whereas normative determinants and intentions in favour of pro-environmental behaviour have been thoroughly studied (e.g., Schwartz, 1977; Stern et al., 1999), gain and hedonistic motives that hinder pro-environmental behaviour are less often included in empirical studies (Thøgersen, 2014, but see; Frick et al., 2021). As well as strengthening personal norms and pro-environmental values, attenuating hedonistic motives, such as aspiration levels, materialism, or fashion consciousness, may be a viable strategy to increase well-being and foster a sufficiency-oriented lifestyle (e.g., Geiger & Keller, 2018; Steg et al., 2012).

Peer endorsement from users of the respective social media platform did not influence sufficiency behaviour. The perceived norms within this group did not have a significant effect on sufficiency behaviour. We conclude that it might be necessary to readjust expectations on how social media may be able to change behaviour through social norms (e.g., Ballew et al., 2015; Goldsmith & Goldsmith, 2011). Prior research showed that peer action on social media can influence behaviour (e.g., Bond et al., 2012) and that social norms are most effective when the influencing individuals are personally known in real life (Abrahamse & Steg, 2013). Perceiving peer endorsement from one's own social network has been found to be more influential than that from unknown people (Senbel et al., 2014). In our study, peer customers or social media users did not fulfil that condition.

Nonetheless, companies can benefit from their communicational efforts to support sufficiency behaviour. Our research showed that attitudes towards the communication and its sender are positive after receiving a sufficiency-promoting intervention. This finding supports the results of other studies that emphasise the beneficial effects of sufficiency-promoting marketing on the reputation and credibility of the respective company (Ramirez et al., 2017; Reich & Armstrong Soule; 2016).

4.1. Strengths and limitations of the studies

The combination of a field experiment with a laboratory experiment presents a strength of our study. Whereas the field experiment provides valuable practical and exploratory insights, the laboratory experiment allowed us to adopt best-practice strategies such as full randomisation and ethical approval. The studies both have behavioural outcome variables, which have been called for to enhance environmental psychology studies (Kormos & Gifford, 2014): In Study 2, actual consumption decisions, also known as revealed preferences, could be measured by a real-world coupon raffle. Such money-allocation tasks are commonly used behavioural measures (Lange & Dewitte, 2019). The consumption

level in Study 1, although it is self-reported behaviour, has the advantage of being measured differently to Likert-scale measures, with a specific time-frame and frequency (as opposed to an unspecific frequency measure such as "often", Lange & Dewitte, 2019). Recalling the number of clothing items acquired is prone to memory bias, yet this affects both times of measurement equally, holding a possible bias constant.

Both studies, however, also had their restrictions. We encountered a number of practicability issues of the transdisciplinary approach, where we conducted the whole research process of the field experiment together with an existing online shop. These issues included the selective convenience sample, the quasi-experimental assignment to conditions, poor control over the communication during the intervention, and the limited number of research questions that could be asked. At the same time, we gained practical and methodological insights on the design, dissemination, and evaluation of sufficiency-promoting communication, which we find have practical implications and are valuable for the research community. Overall, it still must be considered that the methodological challenges of the field study limit the explanatory power of the intervention. Since the laboratory experiment presented social media posts outside the usual context of an Instagram newsfeed, it may lack realism. Further, given the hypothetical nature of the company, it is not completely clear whether individuals would react in accordance with our findings in situations with real brands, which bring a plethora of brand associations and histories. From a methodological perspective, improvements in designing and implementing future studies are also advisable, e.g., the assignment to experimental or control group should be randomized, instead of self-assessed by the respondents. Since we suggest that the behavioural changes found in our field study result from a mere-measurement effect, this assumption should be tested in future research.

Another challenge was the operationalisation of the concept behind sufficiency behaviour. In the field experiment, we equated clothing sufficiency behaviour with the reported number of purchased items. Thus, we applied a broad understanding of the concept, which included reduced clothing consumption but also alternative forms of consumption that help to decrease purchases of new products (e.g., sharing or second-hand purchases). Yet in the laboratory setting, a behavioural measurement fit for short-term effects had to be found. It was important that the dependent variable measures actual behaviour and not just intentions or attitudes. To address this, we used a coupon choice, with the downside that 'consumption reduction' could not be promoted as an option. Thus, participants could opt for donating to a clothing-related NGO or choose a voucher for a second-hand marketplace. This indicator of sufficiency behaviour was adapted from theory (e.g., Jenny, 2016; Kleinhückelkotten & Neitzke, 2019). However, the sufficiency vouchers could have been chosen for other reasons.

In contrast to second-hand vouchers or donating to a NGO for sustainability, the option of not participating in the raffle had no biospheric cues (see Appendix A). As data security concerns could also have impeded people from choosing any voucher at all, we decided not to define this choice as a sufficiency behaviour. Apart from that reason, there is no indication that other, unrelated reasons such as novelty or attractiveness would not be randomly distributed between experimental and control groups. Therefore, they were not expected to alter results but could increase measurement error and thus, statistical power. Future research may further refine this measurement.

4.2. Future research

Implications for future research firstly relate to the question of how sufficiency-promoting communication has to be designed to have long-term effects on sufficiency behaviour. Because the social media posts were presented in the context of a laboratory experiment, the effect should be replicated in another study, for example by integrating the communication posts in participants' newsfeeds. Due to the fictional sender and the related limitations, it would add support to test findings when existing companies and real social media communication are used. Future research should also consider the timing and nature of the sufficiency-promoting message, for instance whether more concrete communication (i.e., fast fashion and textile waste) would be more effective than more abstract ones (i.e., overconsumption and sustainability) (Peifer et al., 2020). Also, the laboratory experiment revealed that both the personal norm as a normative motive and aspiration level as a hedonic motive influence sufficiency behaviour. Thus, future environmental psychology research should examine not only pro-environmental motives but also motives that might pose a barrier towards sustainable consumption. Our research showed that peer endorsement through comments and likes of other social media users not personally known to participants does not influence sufficiency behaviour. To find out more on this issue, future research could compare in a real-world scenario the social norms of known peers with those of unknown people. Another research direction would be to investigate from the perspective of environmental psychology other influential factors that may moderate the effects of sufficiency-promoting communication.

Our findings imply that, especially in a real-world setting, single-post interventions may be too weak to change behaviour, yet further studies are needed to find out more about the possible long-term effects of social media communication and peer endorsement, especially in relation to how well-known peers are to the participants. It would be of great interest to reinvestigate the effects of social media interventions with field experiments including a representative sample, randomized group allocation, and a more intense intervention with communication clearly asking participants both to reduce consumption and to do so repeatedly. Also, the laboratory testing of other peer groups that may transfer pro-environmental social norms offers an interesting path for future research.

Examining other sufficiency fields prevalent in online environments, for example plant-based nutrition or the avoidance of air travel, could be promising, as could studying the effectiveness of a message depending on the sender of the communication. Although we could not find reactance to possible greenwashing in the sample with a fictional company, differences could be tested between actual companies with varying sustainability reputations, and also non-governmental or governmental organisations.

Finally, our research did not investigate marketing techniques such as personalisation based on the evaluation of personal data from social media, user profiles, or community forums. The increasing importance of micro-targeting, on- and offline tracking, big data evaluations, and personalised advertising compared to traditional advertising formats might cause their importance for sufficiency-promoting communication to grow as well. As Study 2 showed sufficiency-promoting communication to be most effective for people already interested in the topic, personalisation may target these groups. At the same time, people with low pro-environmental values may show even less sufficiency over time if they are only confronted with conventional marketing content. Either way, further research is needed in this area.

4.3. Conclusion

Our research demonstrated that sufficiency-promoting communication in social media can be successful in increasing sufficiency behaviour in the short-term. Companies can also benefit from their sufficiency efforts since customers' attitudes towards social media communication and its sender are mostly positive. For establishing social norms for sufficiency, our attempts to boost the effect through the endorsement of distant peer groups, such as fellow customers or social media users, proved to be non-effective. This lack of effectivity possibly dampens the often-articulated hope that social media is a tool for behaviour change.

With this research, we contribute to a better understanding of the opportunities and pitfalls of sufficiency-promoting communication.

Finding positive short-term effects of sufficiency promotion raises hopes: Companies are able to be actors of change. And online communication fostering sufficiency can help in understanding that, in affluent societies, consumption reduction is better for people and the planet.

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CRediT authorship contribution statement

Vivian Frick: Conceptualization, Methodology, Formal analysis, Investigation, Resources, Writing – original draft, Visualization. **Maike Gossen:** Conceptualization, Methodology, Investigation, Resources, Writing – original draft. **Tilman Santarius:** Conceptualization, Methodology, Investigation, Resources, Writing – review & editing, Supervision. **Sonja Geiger:** Conceptualization, Resources, Writing – review & editing, Project administration.

Appendix A

Items of Study 1

Sufficiency behaviour, consumption level (T1, T3):

We would like to know in which way you acquired clothing for yourself during the last four weeks.

Please estimate the amount of clothes for each. All wearable textiles should be included, e.g. shirts, pullovers, pants, jackets, underwear or socks (1 pair counts as 1 piece of clothing).

	0 clothing items	1	2	3	4	5	6 or more clothing items
Local shop (e.g. department store, chain store)	□	□	□	□	□	□	□
Online shop (e.g. Zalando, Tchibo, Otto, Avocadostore, other shops or online brands)	□	□	□	□	□	□	□

Social norm for sufficiency (T1, T2):

Customers of the online shop …

… buy new clothes regularly. (recoded)
… only buy clothes if they really need them.
… try to keep the number of new purchases of clothing low.
… repair their clothes or have them repaired when they are torn, instead of buying new ones.
… treat their clothes with care, so that they last longer.

Personal norm for sufficiency (T1, T2):

I feel obliged to only buy new clothes when I really need them.

My own values tell me that it is wrong to buy unnecessary clothing.

It would give me a bad conscience to buy a new piece of clothing, despite having enough clothes in my cupboard already.

Aspiration level (T1, T2):

Given limitless availability of money and time, how many pieces of clothing (outerwear) would you ideally like to buy annually? [Commentary: Please only indicate the number of outerwear, such as trousers, T-shirts or jackets, not including socks or underwear].

□ no clothing items
□ 1-5
□ 6-10
□ … in steps of 5
□ 55-60
□ more than 60

And how many pieces of clothing would you need to buy annually for your well-being not to be restricted?

Here, we would like you to give an estimation on how many pieces of clothing (outerwear) you would need to buy in order for your well-being not to be restricted.

[Commentary: Please only indicate the number of outerwear, such as trousers, T-shirts or jackets, not including socks or underwear].

□ 1-5
□ 6-10
□ … in steps of 5
□ 55-60
□ more than 60
□ clothing is not relevant for my well-being
□ I would prefer not to buy any clothes at all

Environmental awareness (T1, Geiger, 2019):

I am happy about initiatives which promote sustainable ways of living (e.g. ecovillages, slowfood-movement).
It makes me angry when I see that Germany misses its goals for climate protection.
More environmental protection means improved quality of life and health for everyone.
There are natural limits of growth which our industrialised world has already reached.
Every individual has a responsibility for ensuring a habitable environment for subsequent generations.
We have to find ways to live well independently of economic growth.
I buy ecologically cultivated foods.
When shopping, I choose products with eco-labels (e.g. blauer Engel, EU organic label or EU eco-label).
For my daily travel, I use the bike, public transport or I walk.
Cued recall of intervention (T1):
Did you perceive the communication on the topic „Less is more“?
Please tick the box, if you saw the following:
[Screenshots of Social media posts and newsletter].
□ No □ Yes, once □ Yes, twice □ Yes, more than twice.

Additional items in Study 2

Sufficiency behaviour:
Within this survey a raffle of 10 vouchers worth 10 EUR each will be held.
If you win in the raffle, which of the following vouchers worth 10 Euros each would you like to receive. The raffle will take place within the next 4 weeks.

□ 10 EUR donation to getchanged.net

You will not receive a voucher personally; instead the amount will be donated to Get Changed - The Fair Fashion Network. This non-profit organisation promotes fair and ecological clothing production.

□ 10 EUR voucher from H&M

H&M is a clothing store where you can find a wide range of fashionable clothing online or in a branch near you.

□ 10 EUR voucher from C&A

C&A is a clothing store where you can find a wide range of fashionable clothing online or in a branch near you.

□ 10 EUR voucher from kleiderkreisel.de

At Kleiderkreisel.de you can buy second-hand clothes from other users and you can also resell your own used clothes.

□ I don’t want to participate in this raffle

Social norm for sufficiency:
Most Instagram users …

… buy new clothes regularly.(recoded)
... wear clothes of the newest fashion. (recoded)
… search for clothing online or in stores for fun. (recoded)
… only buy clothes if they really need them.
… treat their clothes with care, so they will be longlasting.
… repair their clothes or have them repaired when they are torn.
… pay attention to longevity when buying clothes.
… buy clothes second-hand instead of new.

Attitude towards communication:

… appeals to me.
… is annoying. (recoded)
… is attractive.
… is easy to understand.
… is informative.

Attitude towards the sender used (Armstrong Soule & Reich, 2015):
What do you think of the organisation „Clothing Company“ on the basis of their instagram appearance? The organisation …

… is trying to increase their profit. (−)
… is trying to win new clients. (−)

… is trying to please existing customers. (−)
… feels morally obliged to help the environment.
… is trying to give something back to the community.
… honestly cares for the well-being of the environment.
… is trying to present their products as more attractive, in order to set higher prices. (−)
… is using the green trend to increase takings. (−)
… does not really care about the environment. (−)

The full survey of study 2 can be found in the supplementary material. The universal values scale can be found with Steg et al. (2012).

Appendix B

Table 9
Mediation for consumption-promoting communication

	b	*se*	*z*	*β*	*p*
Path					
a1	−0.03	0.06	−0.62	-.03	.538
a2	0.08	0.09	0.84	.04	.399
a3	−0.14	1.86	−0.08	.00	.938
b1	−0.02	0.10	−0.15	-.01	.879
b2	0.09	0.07	1.32	.10	.187
b3	−0.01	0.00	−2.34	-.16*	.019
c	−0.16	0.12	−1.32	-.08	.187
Indirect mediation effects					
Social norm	0.00	0.00	0.15	<.01	.882
Personal norm	0.01	0.01	0.71	<.01	.479
Aspiration level	0.00	0.01	0.08	<.01	.938
total	−0.15	0.12	−1.23	-.07	.217
Covariates					
Social norm - personal norm	0.08	0.03	2.63	.11	.008
Social norm - aspiration level	−1.37	0.64	−2.14	-.10	.032
Personal norm - aspiration level	−10.65	1.35	−7.88	-.46	<.001

Notes. Paths are depicted in Fig. 1.

Appendix C. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jenvp.2021.101595.

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