



LEUPHANA
UNIVERSITÄT LÜNEBURG

Bachelor thesis

**Effects of sufficiency-promoting campaigns on the intention to
avoid leisure air travel**

[Auswirkungen von Suffizienzfördernden Kampagnen auf die Absicht, private Flugreisen zu vermeiden]

by

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Abstract

Purpose – The purpose of this thesis is to examine the effects of a sufficiency-promoting campaign on participants' intention to reduce or avoid leisure air travel following the Theory of Planned Behavior.

Design/methodology/approach – A quantitative online experiment was conducted with participants acquired in convenience sampling ($N = 240$) from which half were randomly selected to be exposed to a fictional campaign promoting sufficiency in leisure air travel. After that, all participants were asked to answer questions assessing attitude, subjective norm, perceived behavioral control and intention to reduce or avoid leisure flights. In addition, past flight behavior, the number of flights in the last twelve months, environmental behavior, social desirability, and sociodemographic data were included as control variables.

Findings – Mann-Whitney U tests revealed that the attitude towards reducing leisure air travel was significantly different between the groups: The group of participants exposed to the stimulus evaluated a reduction of air travel more positive. No differences were found for subjective norm, perceived behavioral control, and intention. Findings from a two-step hierarchical regression analysis revealed attitude as the most significant predictor of intention. Within the Theory of Planned Behavior, subjective norm also had a significant, but small influence on intention. When relevant control variables were entered, sufficient past flight behavior for sustainability reasons emerged as a significant predictor, and subjective norm was no longer significant.

Implications – This thesis suggests that sufficiency-promoting campaigns can be useful to create positive attitudes towards reducing leisure air travel. It calls for further longitudinal research on effects of more sophisticated campaigns on intentions and actual behavior.

Keywords – Sufficiency, Communication, Air travel, Theory of Planned Behavior, Advertisement

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List of abbreviations

AT	Attitude
CS	Corporate Sustainability
EB	Environmental behavior
INT	Intention
NF	Total number of flights in the past twelve months
PBC	Perceived behavioral control
SD	Social Desirability
SN	Subjective norm
TPB	Theory of Planned Behavior

1 Introduction

Because of the expanding overconsumption in high-income nations, there has been a growing interest in how to motivate consumers to limit their consumption. In line with the “safe operating space for humanity” described by Rockström et al. (2009, p. 2), consumption should be brought back to a level that is compatible with planetary boundaries and social justice. Thus, a considerable amount of literature has been published on sufficiency-promoting communication. However, while most of the studies are focused on clothing or food consumption, there is an increasingly highlighted need for studies in the field of leisure air travel (Frick et al., 2021).

So far, efforts to reduce aviation-related emissions have mostly been targeted at technological progress for more efficiency and consistency, i.e., reducing fuel consumption and developing less carbon-intensive fuel replacements such as e-fuels. These strategies aim to decouple economic growth, or in this case growth in travel demand, from resource consumption, which has not been proven to work effectively in long-term (Hickel & Kallis, 2020; Parrique et al., 2019, p. 3; Wiedenhofer et al., 2020, p. 13). Consequently, air travel causes more than half of all transport-related tourism emissions, which are proposed to increase to a share of 5.3 % of all human-made emissions in 2030 (Armstrong McKay et al., 2022; Gössling et al., 2013; Pörtner et al., 2022; World Tourism Organization [UNWTO], 2008; World Tourism Organization and International Transport Forum, 2019, pp. 43–44).

To avoid that the increasing demand for air travel will continuously heighten emissions, it is stressed that these strategies must be complemented by sufficiency (Adams, 2005; European Federation for Transport and Environment AISBL, 2023; Higham et al., 2016; International Transport Forum [ITF], 2019, p. 33; Owen et al., 2010, p. 2259; World Tourism Organization and International Transport Forum, 2019, p. 28). In other words, consumer demand for air travel must be reduced and the use of low-emission alternatives facilitated.

Pro-environmental behavior, and particularly sufficient behavior, is, however, often associated with a loss of wealth and sacrificing personal benefits such as time, pleasure, money, or convenience (Kumar & Yadav, 2021). This applies in particular to air travel, where emissions can only be drastically reduced by not travelling, choosing a closer destination or shifting to a low-emission travel mode (Davison et al., 2014; Verfuërth et

al., 2019). Alternative travel modes often entail prolonged travel durations, limited travel range and sometimes even higher prices. Therefore, normative motives (what one should do), are in conflict with hedonic (what feels good) and gain motives, i.e., personal advantages (Lindenberg & Steg, 2007; Steg et al., 2014). This is also referred to as social dilemma between self-oriented versus other-oriented sacrifices, and psychological conflicts between benefits and sacrifices (Seegebarth et al., 2023).

Hence, regulatory top-down measures aimed at sufficiency are often perceived as limiting individual freedom, and thus fail to achieve political and civil support (Higham et al., 2016, p. 346). Consequently, to facilitate sufficient behavior, soft bottom-up measures such as campaigns are needed to reduce inner conflicts and thus improve attitudes and intentions towards sufficiency in air travel (Gossen et al., 2019; Lindenberg & Steg, 2007; Loy et al., 2021). In contrast to business flights that are usually externally determined, air travels for leisure purposes are mostly individual decisions (Müller & Wittmer, 2023). Therefore, campaigns tackling leisure air travel entail high potentials for individual emission reduction (Lacroix, 2018).

By focusing on the intersection of sufficiency-promoting communication and air travel reduction, this thesis aims to answer the following research question: What is the effect of sufficiency-promoting campaigns on the intention to reduce or avoid leisure flights? More precisely, the effects on attitude, subjective norm and perceived behavioral control as well as intention to reduce or avoid flying are investigated following the Theory of Planned Behavior by Ajzen (1991).

2 Theoretical framework and hypotheses

2.1 Sufficiency-promoting communication

As indicated above, sufficiency is a “transdisciplinary concept about ‘enoughness’ of human doings in relation to ecosystems - an end in itself and a means for sustainable consumption and production” (Jungell-Michelsson & Heikkurinen, 2022, p. 6). It aims at bringing material and energy consumption back to a level that maximizes wellbeing for all human beings while remaining compatible with planetary boundaries (Gorge et al., 2015; Huber, 2000; Mincyte et al., 2005).

Jungell-Michelsson and Heikkurinen (2022) differentiate between sufficiency measures on macroscale and on microscale, and between consumption and production side: Certainly, changes on macroscale would have great effect for a

socioeconomic transformation. For example, going beyond measures of production progress or economic growth would allow a redirecting of the economy towards well-being (Boarini & D'Ercole, 2013; Diefenbacher et al., 2016). Also, degrowth, i.e. a planned reduction of resource and energy use in already affluent areas, is a political measure that would allow to increase wealth of poorer parts of the world while maintaining ecological limits (Hickel & Hallegatte, 2022). However, such changes require political will, which can, in a democratic system, only be achieved by building up broad support. But because degrowth is commonly associated with sacrificing quality of life on consumers' side or risking revenues on the side of businesses, it often lacks public support. Therefore, it seems more feasible to initiate change on microscale (Drews & Antal, 2016). For example, behavioral change of consumers could be facilitated towards reducing absolute levels of goods while choosing more long-lasting products, and implementing repairing and sharing practices (Sandberg, 2021).

An idea that recently emerged out of this realization is “sufficiency-promoting communication [...] [that advertises] new, altered consumption patterns and lifestyles [...] [turning] away from the hyper-consumption of past decades” (Gossen & Kropfeld, 2022; Griese & Halstrup, 2013). In other words, it encourages consumers in affluent societies to rethink what improves wellbeing for them in long-term and counteracts wasting money, material and energy on products that do not fulfill this purpose (Gossen et al., 2019, p. 266).

Sufficiency-promoting communication can be part of a company's corporate sustainability marketing and is then also referred to as “sufficiency-promoting marketing”, “green demarketing” or “anti-consumption advertising” (Armstrong Soule & Reich, 2015; Reich & Soule, 2016; Sodhi, 2011). In contrast to social marketing (Hastings & Saren, 2003), sustainable marketing (Belz & Peattie, 2013), and green marketing (Dangelico & Vocalelli, 2017), sufficiency-promoting marketing is not simply facilitating the consumption of more sustainable products. Instead, it contradicts the purpose of conventional marketing of creating demand, and aims at reducing consumer's desire for more (Griese & Halstrup, 2013). Following the traditional framework for instruments of the marketing mix, promotion, i.e. communication, is an important factor among product, price, and place (Pelsmacker, 2018). In the context of sufficiency, communication includes “advertising, information, and education to raise awareness of the need to change consumption practices, and narrative interventions such as storytelling”

(Gossen & Kropfeld, 2022, p. 722): Companies advertise for products while telling consumers to buy less to emphasize their commitment to sustainability and create a more favorable brand evaluation (Gossen & Kropfeld, 2022). Sufficiency is thus understood as achieving a reduction in overall consumption and instead buying more high-quality and sustainable products (Kleinhückelkotten & Neitzke, 2019).

Most examples of sufficiency-promoting communication in the context of corporate marketing can be found in the food and clothing industry, see Table 1. A campaign that was used in several publications was launched by *Patagonia* (2011) with the slogan ‘Don’t buy this jacket’ (Armstrong Soule & Reich, 2015; Elsner, 2023; Hwang et al., 2016). Similar campaigns were launched by an online marketplace for sustainable clothing and products called *Avocadostore*, the outdoor company *VAUDE* and by small businesses like the butcheries *Bohnert* and *Meine kleine Farm* (Gossen & Frick, 2018; Gossen & Heinrich, 2021; Heinrich & Müller-Christ, 2021). Recently, the outdoor company *ORTOVOX* closed its online store for three days during Black Friday weekend as a symbolic act to underline the company’s values. Instead of business-as-usual, they shared sufficiency-promoting messages such as ‘Buy 2nd hand only if you really need something new’ and tips for how to care for and repair clothes (ORTOVOX, 2023).

A real-world example that was launched outside of corporate marketing is a campaign run by the German government in 2009 to target everyday mobility behavior and facilitate less car use (Reutter, 2010). Evaluations showed that 64% of respondents stated that they feel encouraged in their prior behavior of going by foot or taking the bicycle and more than half felt inspired to question their behavior. About one third of respondents had the intention to walk or bicycle more in the future because of the campaign (Reutter, 2010). An important aspect of the campaign was its combination of humor with an important message: Numerous studies have emphasized the efficacy of using humor and creating enthusiasm in pro-environmental campaigns, especially when combined with a factual text (Bonnici et al., 2023; Searles, 2010; Skurka & Lee Cunningham, 2023).

A different example is a marketing campaign launched by *Deutsche Bahn*, the national railway company of Germany, in 2018: Instead of telling consumers to travel less in general, and thus risking a decline in revenue, the campaign presents their product – the low-emission journey by train – as more favorable than the high-emission journey

by plane. More precisely, the campaign showed two similar looking pictures of travel destinations, one being far away and the other one in Germany, and contrasted costs of a flight for the long-distance journey with much lower costs for a railway ticket within Germany. The caption of the advertisement referred to saving money by refraining from flying. Consequently, air travel is reframed from being a superior travel mode in costs, time and convenience to be an unnecessary, costly alternative (Hergesell & Dickinger, 2013).

Table 1

Overview of real-world examples for sufficiency-promoting communication

Sector	Sender	Description	Number of employees	Year	Slogan(s)	Medium	Source
Clothing	Patagonia, Inc.	Sustainable outdoor clothing and gear	approx. 1000	2011, 2022	“Don’t buy this jacket”, “Buy less, demand more”	Newspaper, poster, website	(Armstrong Soule & Reich, 2015; Elsner, 2023; Hwang et al., 2016)
	Avocadostore GmbH	Online marketplace for sustainable clothing	45	2017	“Buy less, buy better, and really wear it” or “Do you really need it?”	Social media, website	(Elsner, 2023; Gossen & Heinrich, 2021)
	VAUDE GmbH & Co. KG	Sustainable outdoor clothing and gear	656	2017	“Don’t buy this tent, rent it”	Social media, website, CSR reports	(Gossen & Heinrich, 2021)
	ORTOVOX Sportartikel GmbH	Sustainable outdoor clothing and gear	157	2023	“Buy 2nd hand only if you really need something new”	Website, social media	(ORTOVOX, 2023)
Food	Metzgerei Bohnert e.K.	Family-run butchery	9	2009-2023	„Iss weniger Fleisch, dafür Gutes aus der Region.“	Website, store	(Heinrich & Müller-Christ, 2021; Metzgerei Bohnert e.K., 2023)
	Meinekleine-Farm.org GmbH	Online butchery	6	2023	“Weniger Fleisch – mehr Respekt”	Stand-up displays, flyers, social media	(Heinrich & Müller-Christ, 2021)
Transport	Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit	German Federal Ministry	-	2009	“Kopf an: Motor aus.”	Banners, posters, radio, newspaper, shopping cart, movie theater, stickers	(Reutter, 2010)
	Deutsche Bahn AG	National railway company of Germany	323,716	2018	“Spar dir den Flug.”	Social media	(Bundesverband Digitale Wirtschaft (BVDW) e.V., 2019)

As such, the campaign by *Deutsche Bahn* used so-called “goal-framing effects” or “nudging” techniques that change the environment in which alternatives are presented and thus put the focus on different comparative aspects (Mont et al., 2014). Thereby, hedonic and gain goals, in this case for example costs and duration, are made more compatible with normative ones, such as joy and adventure (Lindenberg & Steg, 2007).

This is congruent with insights of Moser et al. (2015), who found out that local travels in Switzerland were perceived only slightly less attractive than vacations around Europe – possibly because they included a similar level of hedonic or gain benefits.

Sufficiency-promoting campaigns are increasingly implemented, but its efficacy on reducing consumption is controversial, see Table 2 (Gossen & Kropfeld, 2022). Hwang et al. (2016) confirmed that purchase intentions of participants who saw an anti-consumption ad were lower than those who were shown a traditional ad with the same product. The effect was confirmed by a study on electricity saving, where demarketing at least diminished the increase in consumption (Ramirez et al., 2017). Frick et al. (2021) confirmed sufficiency-enhancing effects by social media posts in a laboratory experiment. However, they did not find an effect in a field experiment, in which both groups reduced their consumption, indicating possible effects of the survey itself. In contrast to the findings of Hwang et al. (2016), a recent study by Elsner (2023) revealed that anti-consumption advertisements can enhance emotional response, perceived credibility and perceived information quality, which in turn increase purchase intention.

In the field of air travel, only few studies have been conducted, although sufficiency-promoting communication in that field has become increasingly relevant and promises a high emission reduction potential (Wynes et al., 2018): Seegebarth et al. (2023) recently concluded that informing about the impacts of air travel should help to raise consumers' environmental concern and establish controversial debates about air travel, thus enhancing their intention to reduce air travel. However, this has not proven to be successful in a study of Berneiser et al. (2022), where participants were exposed to different informational stimuli about the social and environmental impacts of aviation. One reason might be a lack of emotional involvement in a solely informational campaign, but it is also possible that increased normative motives were not able to beat hedonic and gain motives. In addition, Hesse and Rünz (2022) qualitatively evaluated people's response to a sufficiency-promoting advertisement aimed at air travel and found mostly positive reactions. They also concluded that a campaign might be more useful in a neutral context whereas, for example, an airport might lead to feelings of guilt and therefore negative reactions to the campaign.

Table 2*Overview of literature review about effects of sufficiency-promoting communication*

Author(s)	Sector	Conceptual/theoretical framework	Research design	Findings	Positive effect of stimulus on sufficiency
Hwang et al. (2016)	Clothing	Combined measures from different theories (i. a. environmental concern, attitude, purchase intention), Theory of Reasoned Action (Ajzen & Fishbein, 1980)	Online experiment with traditional versus anti-consumption ad from Patagonia as stimuli for different groups	Lower attitudes and purchase intentions in experimental group with anti-consumption ad; positive effect of environmental concern for control group (i. a.)	Yes
Ramirez et al. (2017)	Electricity	Appraisal-emotional response-coping framework (Bagozzi, 1992)	Two studies: Online experiment with stimulus to measure firm perception; field intervention with longitudinal design to measure behavior	Positive attitudes towards organization through stimulus (1); slower increase in consumption in group with stimulus (2)	Yes
Frick et al. (2021)	Clothing	Multiple goals theory (Lindenberg & Steg, 2007)	Two studies with social media stimulus: Online field intervention with longitudinal design and control group (1); online laboratory experiment with different stimuli (neutral, sufficiency-, consumption-promoting) (2)	Effects for both control and experimental group (1); more sufficient behavior (2)	No (1); yes (2)
Berneiser et al. (2022)	Air travel	Combined measures from different theories (i. a. pro-travel attitude, environmentally careless holiday attitude, PBC, demographic variables as predictors, intentions to avoid flights as outcome variable)	Different informational stimuli on impacts of aviation	PBC and low pro-travel attitude, age, lower education, lower environmentally careless holiday attitude as predictor of intention (i. a.); no effect of stimuli on intentions	No
Elsner (2023)	Clothing	Stimulus-Organism-Response model (Foscht et al., 2017)	Online questionnaire with sufficiency-promoting stimulus	Emotional reaction, perceived credibility, and perceived information quality were enhanced through stimulus; these variables enhance purchase intention	No

To sum it up, a lack of research on the effect of sufficiency-promoting communication on leisure air travel has been found, especially for campaigns using goal-framing and nudging techniques. Therefore, this thesis uses a fictional campaign based on the one from *Deutsche Bahn* to find out whether it can successfully enhance sufficient behavior in leisure air travel.

2.2 Application of the Theory of Planned Behavior

The Theory of Planned Behavior (TPB) is a well-tested model developed by Ajzen (1991), which states three independent determinants of an individual's intention to perform a certain behavior. These are *attitude*, i.e., “the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior”, *subjective norm*, i.e., “the perceived social pressure to perform or not to perform the behavior”, and

perceived behavioral control, which “refers to the perceived ease or difficulty of performing the behavior” (Ajzen, 1991, p. 188). According to the theory, high levels of attitude, subjective norm and perceived behavioral control are assumed to increase an individual’s intention to perform the behavior (Ajzen, 1991). However, the influence of each factor and the explanatory power of the theory vary: In a meta-study covering a number of different contexts, the TPB accounted for 27 % of the variance in behavior and for 39 % in intention (Armitage & Conner, 2001).

When applied to car-use reduction, the TPB has shown to be useful: People’s intention to use a travel mode is not only decided by the sum of all positive and negative expectations, i.e., their attitude, but also by situational constraints. Instead, they also take into account how difficult it would be to use a travel mode and to which degree significant reference persons would approve it (Bamberg et al., 2011).

In the field of air travel, the TPB was applied by Morten et al. (2018): Attitude and subjective norm were significant predictors of intentions to reduce leisure air travel and accounted for a substantial amount of the variance in intentions. Berneiser et al. (2022) identified, among others, perceived behavioral control to travel without flying as a positive and pro-travel attitude as a negative predictor. Furthermore, Dütschke et al. (2022) confirmed the predictive value of perceived behavioral control on the intention to use other travel modes than an airplane for leisure travel. Thus, TPB can be seen as a useful theoretical basis for assessing an individual’s intention to reduce or avoid leisure air travel.

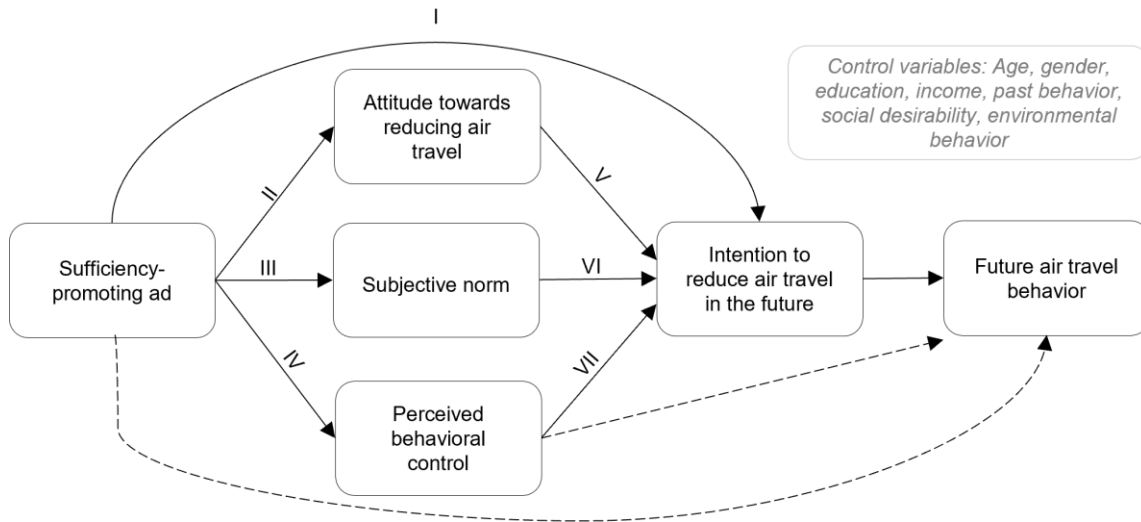
Critics state, however, that past behavior is missing in the TPB as a factor for intentions and future behavior, especially in the field of sustainability (Rise et al., 2010; Robinson & Smith, 2002). For example, Bagozzi and Warshaw (1990) endorsed the inclusion of past behavior into the TPB, resulting in their Theory of Trying. The frequency of past behavior has shown high predictive power for behavior in several studies, indicating the importance of habits (Ouellette & Wood, 1998). Thus, following the study of Morten et al. (2018), past behavior is included as a control variable in this thesis.

Moreover, air travel behavior is in turn often associated with certain demographic characteristics such as young age, above average income and high education (Aamaas et al., 2013; Bruderer Enzler, 2017; Dütschke et al., 2022; Lacroix, 2018; Schubert et al., 2020). Also, environmental behavior can influence the intention to reduce or avoid air

travel (Seegebarth et al., 2023). Therefore, these variables are controlled as well. Based on the theory, a conceptual model was developed (see Figure 1).

Figure 1

Conceptual model following the Theory of Planned Behavior



Note. The model is adapted from Ajzen (1991).

2.3 Summary of hypotheses

The following hypotheses were derived from theory and literature review:

- I. Participants exposed to a sufficiency-promoting stimulus (group 1) have a higher intention to reduce or avoid leisure air travel in comparison to participants not exposed to such a stimulus (group 2).*
- II. Participants exposed to a sufficiency-promoting stimulus (group 1) have a more positive attitude towards reducing air travel in comparison to participants not exposed to such a stimulus (group 2).*
- III. Participants exposed to a sufficiency-promoting stimulus (group 1) have a more positive subjective norm towards reducing air travel in comparison to participants not exposed to such a stimulus (group 2).*
- IV. Participants exposed to a sufficiency-promoting stimulus (group 1) have a higher level of perceived behavioral control in comparison to participants not exposed to such a stimulus (group 2).*

V. The intention to reduce or avoid leisure air travel can be predicted by the attitude towards reducing or avoiding air travel.

VI. The intention to reduce or avoid leisure air travel can be predicted by the subjective norm towards reducing or avoiding air travel.

VII. The intention to reduce or avoid leisure air travel can be predicted by the perceived behavioral control over reducing or avoiding air travel.

3 Methods

3.1 Participants and design

An online experiment with two groups of randomly assigned participants was conducted to gather quantitative data about the effects of a fictional, sufficiency-promoting campaign. Therefore, one of the groups was exposed to an advertisement during the survey, see Appendix A, while the other worked as a control group without a stimulus. All of the participants were asked to fill out a self-completion questionnaire assessing attitude, subjective norm, perceived behavioral control and intention. Furthermore, environmental behavior, past behavior, social desirability, and sociodemographic data were collected to control for biases. For statistical analysis of hypotheses I-IV, comparison tests were conducted to look for significant differences among means of TPB variables between the groups. Moreover, bivariate correlations and a multiple linear regression were conducted to check whether TPB variables are related as proposed by hypotheses V-VII.

Due to practical considerations, participants were acquired with convenience sampling using the personal network of the researcher. Since the sample is not representative for the target population of German citizens, the findings of the thesis cannot be generalized (Neuman, 2014).

In total, 247 participants completed the questionnaire. Six participants of the experimental group answered in a check question that they did not see the stimulus due to technical difficulties, which is why they were excluded from the sample. Moreover, case 77 was excluded since a total number of 26 flights within twelve months seemed exceptionally high. This resulted in a final sample with $N = 240$ participants, of which $n = 114$ were in the experimental group and $n = 126$ in the control group.

3.2 Experimental manipulation

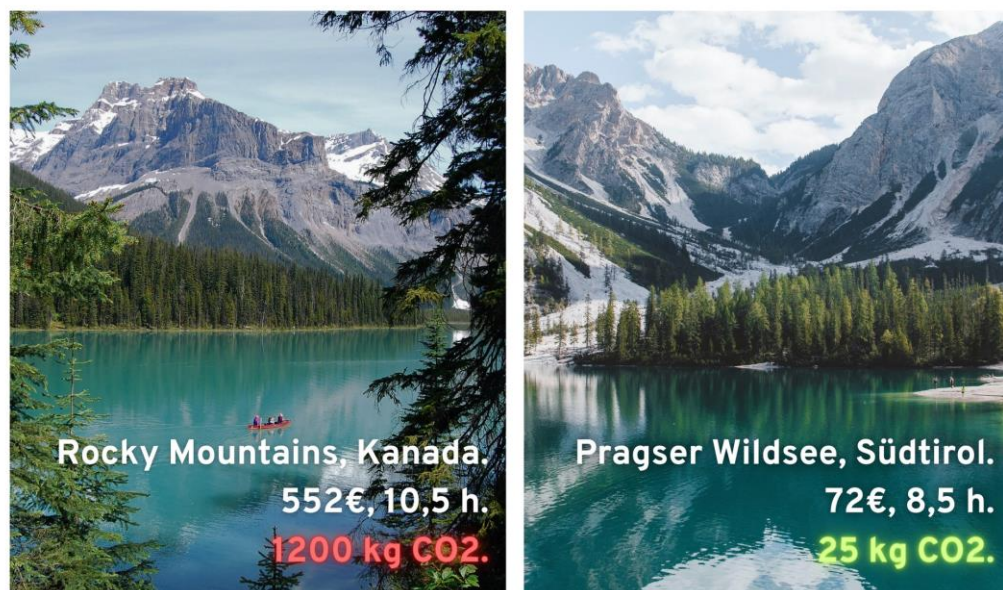
The experimental manipulation was designed based on insights from chapter 2.1. As such, the fictional advertisement was based on the example by Deutsche Bahn (see Figure 2) visually contrasting two travel destinations with similar looking pictures. Because the target group in this case are people living in Germany, one of the destinations must be reachable by train. Therefore, the Braies Lake in South Tyrol was chosen as an alternative to the Rocky Mountains in Canada.

To stimulate a comparison of environmental impact versus personal gains, information on travel duration, minimum costs and CO₂ emissions were added using an exemplary starting point in Frankfurt am Main as well as a travel date three months ahead. According to the route calculated by Google Ireland Limited (2024), travelling from Frankfurt am Main to the Braies Lake takes about 600 km by long-distance train, 50 km by local train and 11 km by public bus. Using a CO₂ calculator that is based on information of the Umweltbundesamt, total emissions of about 25 kg CO₂ were calculated (Kemmerzell, 2024; Umweltbundesamt, 2021). However, values for exact CO₂ emissions vary depending on data base: For example, a company-specific emissions calculator by Deutsche Bahn charges only 0.04 kg CO₂ for the 400 km journey from Frankfurt am Main to Munich (DB Fernverkehr AG, 2024a). Summing up ticket prices from Deutsche Bahn and public transport in South Tyrol resulted in about 72 € (DB Fernverkehr AG, 2024b; STA – Südtiroler Transportstrukturen AG, 2024). To calculate emissions and costs for a flight to the Rocky Mountains in Canada, Calgary was chosen as destination. According to Expedia, Inc. (2024), prices start at about 552 € and emissions vary from 1.0 to 1.2 tons CO₂ depending on the calculator used (Carbon Footprint Ltd, 2024; Foundation myclimate, 2024). Due to the small relative difference, travel emissions from the airport to the mountains were neglected.

As an appeal to encourage environmental responsibility and thereby enhance normative motives, the caption by Deutsche Bahn “Spar dir den Flug” was complemented by “Für Dich und die Natur”, literally translated “For you and nature”.

Figure 2

Sufficiency-promoting advertisement used as stimulus in the experiment



Spar dir den Flug - für Dich und die Natur.

*berechnet ab Frankfurt am Main.

Note. This image was created using Canva and freely usable pictures from Unsplash; photographs Soares, B (left), Groblechner, S (right).

3.3 Operationalization of the variables

To measure TPB variables, which are attitude (AT), subjective norm (SN), perceived behavioral control (PCB), and intention (INT), established scales were adapted and translated to German if necessary, see Table 3 and Appendix A. Also, a scale for environmental behavior (EB) was included following previous research (Elsner, 2023).

Additionally, social desirability (SD) was measured to avoid biases that occur when participants want to look better to others, feel good about themselves or give answers complying with their self-identity (Larson, 2019). This is especially relevant in the field of air travel because of the phenomenon “flight shame” (Andersen, 2024, p. 202; Becken et al., 2021, p. 1450): “an individual's uneasiness over engaging in [an] energy-intensive and climatically problematic [activity]” such as air travel (Gössling, 2019, p. 1).

The included two-scale instrument measures: the exaggeration of positive qualities (PQ+) as well as the understatement of negative qualities (NQ-). Despite having six instead of 33 items as in the standard scale by Crowne and Marlowe (1960), it strongly correlates with it and has high levels of internal consistency (Larson, 2019). After

checking for internal consistency reliability, see chapter 3.5, each variable was created calculating the mean of all items within a scale.

Table 3

Operationalization of variables with established scales

Variable	Operationalization		Source
	Number of items	Scale	
Intention	3	5-point Likert scale from strongly disagree (1) to strongly agree (5)	(Morten et al., 2018)
Attitude	5	Dichotomous items with each two contrary adjectives, e.g., bad (1) to good (5)	(MacKenzie et al., 1986)
Subjective norm	2	5-point Likert scale from strongly disagree (1) to strongly agree (5)	(Morten et al., 2018)
Perceived behavioral control	3	5-point Likert scale from strongly disagree (1) to strongly agree (5)	(Morten et al., 2018)
Environmental behavior			(Geiger, 2020)
Items 1-5	5	6-point frequency scale from never (0) to always (5)	
Items 6-8	3	Binary scale with yes (5) and no (0)	
Social Desirability			(Kemper et al., 2012)
Exaggeration of positive qualities	3	5-point Likert scale from strongly disagree (1) to strongly agree (5)	
Understatement of negative qualities	3	5-point Likert scale from strongly disagree (1) to strongly agree (5)	

Note. Although not consistent with the other scales, the questions for EB were coded the same as in the original study by Geiger (2020) to allow for a retrospective comparison with a representative sample of the German population.

Following previous studies, also the number of flights (NF), past behavior (PB) and sociodemographic data were included as control variables (Berneiser et al., 2022; Dütschke et al., 2022; Morten et al., 2018).

NF was assessed following Morten et al. (2018): Participants were asked to fill in their number of leisure flights in the past twelve months, divided into domestic flights, flights within and flights across continents. These were summed up for further analyses.

For PB, participants should indicate whether they have used leisure air travel more, less, or the same compared to former times. If respondents answered “less” or if their added number of flights was zero while answering “similar”, an additional open-ended question asked them for reasons. The answers can be clustered afterwards to find the share of people already flying less and the frequency of environmental reasons.

To collect sociodemographic data, participants were asked to fill in their year of birth, gender and highest level of education attained. Furthermore, they should assign themselves to a category of household income based on Statistisches Bundesamt (2023c).

3.4 Questionnaire

After having operationalized the variables, all items were combined into a questionnaire, see Appendix A. To reduce social desirability bias, the purpose and the connection to sufficiency was disguised by publishing it as a survey with the title “the future of air travel”. Additionally, the questionnaire began by assuring subject anonymity and confidentiality, and encouraged to honestly answer all questions. As indirect measures, single items were randomized within scales, and in the case of SN, PBC and INT, even across scales, and some inverse coded items were included (Larson, 2019).

Part of the development was pretesting the questionnaire. A total of nine respondents were instructed to report on difficulties and give feedback on unclear wording on each page of the questionnaire. This method allows to detect technical defects, frequency distributions of the responses and average duration of the questionnaire completion. It does not actively probe participants’ understanding but encourages them to address any issues in answering the questions (Lenzner, T., Neuert, C., & Otto, W., 2016).

Following insights from the pretest, several revisions were done to improve comprehensibility: In the items for SN, PBC and INT, negative wording seemed to impede answering, which is why some inverse coded items were restated. Also, some respondents were confused by questions about environmental behavior at the beginning when answering a questionnaire about air travel. Therefore, items about past flight behavior were put on the first page. Furthermore, it was allowed to refuse single items to avoid distortions, for example, when the behavior does not apply to them.

The final questionnaire consisted of fifteen questions from which three were only visible to some of the participants: Only participants who stated to fly less or fly not at all were asked for reasons (question 2a and 2b, see Appendix A), and only participants in the experimental groups were asked if they saw the stimulus (question 5). It began with questions about PB, followed by EB. After that, half of the participants were exposed to the stimulus and instructed to imagine it on an advertising space and to let it sink in, followed by a control question to check if they were able to see the advertisement. The questionnaire continued by assessing INT, AT, SN, and PBC, and concluded by collecting sociodemographic data. The latter was introduced with a motivational note and another hint about data anonymity to enhance participant’s willingness to expose personal information. After submitting, participants received instructions to not share any

contents of the survey. The final publishment took place on November 1st, 2023, and the survey was open until November 10th.

3.5 Internal consistency reliability and construct validity

To make sure that all scales can be applied for further analysis, their reliability and validity must be checked. Content validity of the scales, i.e. how precisely they fit what they aim to measure, remains a subjective decision (Hajjar, 2018). However, it can be assumed that content validity is given since established scales have been used with only slight adaptations and the items have gained feedback in the pretest.

For an objective analysis, a well-established method is to calculate Cronbach's alpha for internal consistency reliability (Cronbach, 1951). Although there is wide range of descriptors to interpret values of Cronbach's alpha, there seems to be agreement that a value of $\alpha \geq .7$ is desirable (Taber, 2018). For two-item scales, it is recommended to use the Spearman-Brown reliability estimate (Eisinga et al., 2013). Cohen (1988) describes medium effect sizes for $\rho \geq .3$ and large effect sizes for $\rho \geq .5$. As with Cronbach's alpha, there is a variety of cut-offs defined in the literature, in which a strong correlation is sometimes only assumed when $\rho \geq .7$ (Schober et al., 2018). Moreover, the corrected item-total correlation should be $\geq .5$ for each item (Hajjar, 2018). Since it is controversial if inter-item correlations should be used to include or exclude single items, it was not included as a quality criterion (Borgstede, 2019).

The scales for intention, attitude and subjective norm showed good levels of internal consistency and were thus converted into variables without any changes, see Table 4. The internal consistency of measures for perceived behavioral control were rather low, see original values in Appendix B. However, the third (inverse coded) item could be identified to have a low item-total correlation of .26. Therefore, it was excluded for further analysis. Since three items for environmental behavior had a different, dichotomous scale, standardized Cronbach's alpha was used. Although the construct was adopted from Geiger (2020) without any changes, only three items had an item-total correlation of $\geq .5$. However, the two items about efficiency of household appliances (item EB5, see Appendix A) and about green power supply (item EB8) had notably lower item-total correlations of $<.20$. Moreover, both questions were often not answered, which led to an exclusion of many cases. Therefore, these two items were excluded from the scale for further analysis. The two subscales for social desirability

achieved acceptable but low levels of internal consistency. However, it was decided to keep the original scale to avoid changes in its content validity.

Table 4

Internal consistency reliability of applied scales

Scale	<i>n</i>	Cronbach's α	Spearman-Brown coefficient ρ	Corrected item-total correlations
Intention	215	.78		
INT1				.68
INT2				.73
INT3				.48
Attitude	206	.86		
AT1				.80
AT2				.58
AT3				.64
AT4				.67
AT5				.69
Subjective norm	214		.82	
SN1				.70
SN2				.70
Perceived behavioral control	238		.74	
PBC1				.59
PBC2				.59
Environmental behavior	207	.72		
EB1				.52
EB2				.55
EB3				.38
EB4				.31
EB6				.41
EB7				.44
Social Desirability PQ+	235	.57		
PQ1				.33
PQ2				.43
PQ3				.39
Social Desirability NQ-	226	.50		
NQ1				.34
NQ2				.30
NQ3				.33

Note. Names of items refer to codes used in the questionnaire, see Appendix A. All values picture resulting scales after excluding incompatible items; the original table can be found in Appendix B.

4 Results

4.1 Descriptive analysis

As shown in Table 5, the sample turned out to have an overrepresented share of female participants and a very large share of highly educated individuals. Average age was younger than in the German population; however, there were two clusters around the age of 25 and 60, see Appendix C. While the share of people with very high income within the sample is similar to the German population, there is an overrepresented share of people with very low income.

Table 5*Sociodemographic characteristics of participants in comparison with German population*

Variable	Sample (N = 240)	German Population (2021)
Age		
M (SD)	38.4 (16.6)	44.7 (n/a)
Gender		
Female	68.3 %	50.6 %
Male	29.6 %	49.3 %
Diverse	2.1 %	n/a
Income		
Less than 1249 €	25.4 %	11.9 %
1250-1749 €	3.8 %	10.2 %
1750-2499 €	11.7 %	16.0 %
2500-3499 €	17.5 %	17.8 %
3500-4999 €	18.8 %	18.3 %
More than 5000 €	22.9 %	25.7 %
Educational level*		
Low (ISCED 1-2)	5.0 %	22.3 %
Middle (ISCED 3-4)	37.5 %	50.4 %
High (ISCED 5-8)	56.7 %	27.1 %

Note. Sources for information about the German population: Age (Statistisches Bundesamt [Destatis], 2022), gender (Statistisches Bundesamt [Destatis], 2023b), income (Statistisches Bundesamt [Destatis], 2023c), educational level (*International Standard Classification of Education*, 2012; Statistisches Bundesamt [Destatis], 2023a).

*0.8 % did not answer this question.

When looking at the means of all metrical variables, see Table 6, it can be seen that the intention is quite high among all participants, which means that they rather intend to avoid air travel in the future on average. The two groups are very similar, but the experimental group tends to have a higher intention to avoid air travel. The overall attitude towards reducing air travel is rather positive, which means that participants are in favor of flying less. It can be seen that participants in the experimental group evaluated the reduction of air travel more positive than those in the control group. Levels of subjective norm indicated that participants rather agreed that people in their surroundings would favor reducing air travel for sustainability reasons. Values across groups were similar, with a tendency towards more perceived social pressure in the experimental group. Moreover, it is noticeable that all participants had high levels of perceived behavioral control. Accordingly, they felt confident in determining whether to use air travel or not. With regard to number of flights, it must be noted that average number of flights was slightly higher in the control group. Levels of environmental behavior were similar across both groups; however, the sample had higher levels of environmental behavior than in the average German population, $M (SD) = 2.31 (0.87)$ (Geiger, 2020). Accordingly, participants stated to act more environmentally friendly than average Germans do. Both variables for social desirability were profoundly higher than in

the original study, where values were rather neutral with a slight tendency towards agreeing, $M (SD) = 2.73 (0.73)$ for PQ+ and $M (SD) = 3.19 (0.80)$ for NQ- (Kemper et al., 2012). This indicates that participants tended to exaggerate their positive qualities and understated negative qualities. More specifically, they may have stated that they want to reduce and avoid air travel more than they actually do.

Table 6*Descriptive statistics of applied scales*

Variable	Experimental group			Control group	Total (N = 240)	
	n	Min.	Max.	M (SD)	M (SD)	
Intention	239	1.00	5.00	3.58 (1.16)	3.49 (1.11)	3.53 (1.13)
Attitude	235	1.00	5.00	3.90 (0.93)	3.64 (0.92)	3.76 (0.93)
Subjective norm	231	1.00	5.00	3.20 (1.16)	3.09 (1.00)	3.15 (1.08)
Perceived behavioral control	240	2.00	5.00	4.47 (0.74)	4.44 (0.71)	4.46 (0.72)
Number of flights	240	0	13	1.75 (2.62)	2.22 (2.37)	2.00 (2.50)
Environmental behavior	240	0.17	5.00	2.73 (1.01)	2.68 (1.07)	2.70 (1.04)
Social Desirability PQ+	240	2.00	5.00	3.62 (0.58)	3.73 (0.61)	3.68 (0.60)
Social Desirability NQ-	240	1.33	5.00	4.09 (0.78)	4.10 (0.72)	4.09 (0.75)

When being asked about leisure air travel behavior, see Table 7, almost half of all respondents answered that they recently flew less than in the past. About one third said they flew about the same than in the past, of which more than a third haven't done any air travels in the last twelve months (NF = 0). Consequently, these respondents - about every seventh - are probably using air travel rarely or not at all. Less than every fifth participant said they recently flew more than in the past.

Table 7*Past flight behavior*

Answer	Number of flights	Experimental group	Control group	Total (N = 240)
		n (%)	n (%)	n (%)
Flew more	NF = 0	3 (1.3)	0 (0)	3 (1.3)
	NF > 0	15 (6.3)	22 (9.2)	37 (15.4)
Flew equally often	NF = 0	17 (7.1)	17 (7.1)	34 (14.2)
	NF > 0	16 (6.7)	29 (12.1)	45 (18.8)
Flew less	NF = 0	43 (17.9)	26 (10.8)	69 (28.8)
	NF > 0	18 (7.5)	31 (12.9)	49 (20.4)
		112 (46.7)	125 (52.1)	237 (98.8)
Others		2 (0.8)	1 (0.4)	3 (1.3)
Total		114 (47.5)	126 (52.5)	240 (100.0)

Participants who flew less than in former times (answered "flew less" in question 2, see Appendix A) and those who don't fly at all (answered "flew equally often" in question 2, and had no flights in the past twelve months in question 1) showed sufficient air travel

behavior. Therefore, they were asked to give reasons for their behavior in an open-ended question. All named reasons were clustered into four groups, which are in descending order 1) sustainability-related, 2) preferences for different travel modes or locations as well as no necessity to use air travel, 3) personal circumstances such as financial reasons, children or pets, fears, and no time for vacation, and 4) the coronavirus pandemic. Each answer was allocated to one or multiple clusters; each participant named 1.2 reasons on average. About one third explained their sufficient behavior with sustainability among others, see Table 8. More than every sixth reason could be allocated to personal preference, which means that these people preferred different travel modes over flying or did not consider it necessary for their journeys. About the same share of reasons named were circumstances, meaning that these people felt externally forced to avoid air travel. A minor share of answers could be allocated to the coronavirus pandemic. Comparing the two groups, differences can be found in the share of answers that were allocated to preferences and circumstances: Preferences were named more often in the control group whereas circumstances were named more often in the experimental group. Sustainability and coronavirus pandemic were named similarly often.

Table 8

Frequency table with reasons for less or no leisure air travel

Reasons	Experimental group ($n = 72$)	Control group ($n = 68$)	Total ($n = 140$)*
	f (%)	f (%)	f (%)
Sustainability	35 (21.1)	37 (22.3)	72 (30.0)
Preferences	19 (11.4)	25 (15.1)	44 (18.3)
Circumstances	25 (15.1)	16 (9.6)	41 (17.1)
Coronavirus pandemic	5 (3.0)	4 (2.4)	9 (3.8)
Total	84 (50.6)	82 (49.4)	166 (100.0)

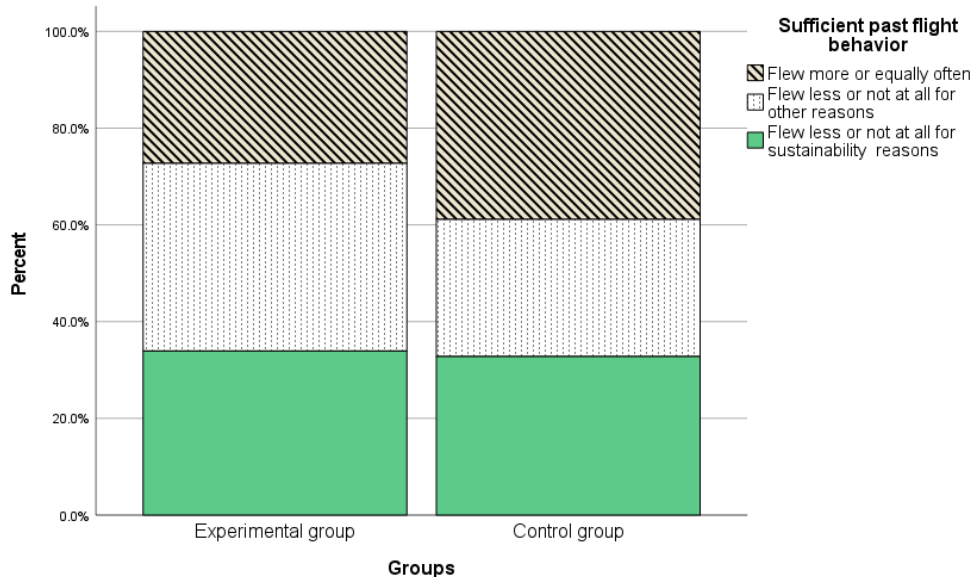
*Twelve answers could not be allocated to categories because they did not give a reason.

Data from both questions were combined into a new variable with three categories, see Figure 3: Respondents that showed sufficient past behavior, in other words, who have flown less or not at all in the past for sustainability reasons ($n = 72$, 30.0 %), those that have flown less or not at all in the past for other reasons ($n = 81$, 33.8 %) and those that flew more or continued to fly often ($n = 87$, 36.3 %). This variable will be used for further analysis. It can be seen that both groups have about the same share of people who flew less or not at all for sustainability reasons. However, there are more

people who flew less or not at all for other reasons in the experimental group, whereas there are more people who flew more or equally often in the control group.

Figure 3

Distributions of sufficient past flight behavior among both groups



4.2 Testing of hypotheses

4.2.1 Differences of experimental groups in TPB variables

To test for hypotheses I-IV, differences between experimental and control group in TPB variables - intention, attitude, perceived behavioral control, and subjective norm - must be compared. Since graphical investigations and statistical analysis with Kolmogorov-Smirnov Goodness of Fit test and Shapiro-Wilk test failed to confirm normal distribution, see Appendix D, Table D1, Mann-Whitney U tests were conducted.

The Two-sample Kolmogorov-Smirnov test revealed differences in distribution between the groups for perceived behavioral control and subjective norm, but not for intention and attitude, see Table 9. Therefore, medians are interpreted for INT and AT and mean ranking sum is looked at for SN and PBC.

Mann-Whitney U tests revealed significant differences in attitude between the groups, see Table 9. The mean of attitude in the experimental group was higher, which is why hypothesis II cannot be rejected. In other words, participants that were exposed to the stimulus evaluated a reduction of air travel more positive than the control group; however, effect size was small, $r = -.16$, $r^2 = .02$ (Cohen, 1988). Participants of the

experimental group also perceive a slightly stronger social pressure to reduce flights, i.e. have higher levels of subjective norm, and feel a bit more confident in their behavioral control. However, the differences were not significant in Mann-Whitney U tests, which is why hypothesis I, III and IV must be rejected.

Table 9

Two-sample Kolmogorov-Smirnov tests and Mann-Whitney U tests for TPB variables

Variable	Two-Sample Kolmogorov-Smirnov tests		Mann-Whitney U tests				
	Asymp. sig. (two-tailed)	n	p	Experimental group		Control group	
				M_{Rank}	Mdn	M_{Rank}	Mdn
Intention	.055	239	.44	-	3.67	-	3.67
Attitude	.167	235	.02	-	4.20	-	3.60
Subjective norm	.013	231	.50	119.11	-	113.17	-
Perceived behavioral control	<.001	240	.59	122.84	-	118.38	-

Note. Detailed tables can be found in Appendix D, Table D2 and Table D3.

4.2.2 Predicting intentions using TPB and control variables

To test for hypotheses V-VII, a hierarchical regression was conducted in two steps. At first, only TPB variables were included, and then control variables were entered in step two. To make sure that assumptions for a regression analysis were fulfilled, a first model was calculated including all control variables, see Appendix E, Table E1. When analyzing the residuals, two cases were identified as outliers: Case 75 and 191 had values of < -3 in standardized and studentized deleted residuals. Leverage values were <.2 and cook distances < 1.0, which did not indicate any other outliers (Huber, 1981). According to graphical investigations, variance was homogenous, and residuals were normally distributed, see Appendix E, Figure E1 and Figure E2. Durban-Watson statistic did not display autocorrelation, $d = 1.97$ (Allen, 1997). Collinearity statistics did not indicate multicollinearity, all tolerances > .49 and all VIF's < 2.04. A high goodness of fit was indicated by $R^2 > .26$ (Cohen, 1988).

Next, bivariate correlations were calculated with all remaining cases to determine whether any of the control variables were associated with the intention to reduce or avoid leisure air travel and should thus be included as control variables in the final regression analysis. A strongly positive correlation with intention was found for environmental behavior, and a moderately negative correlation for total number of flights in the past twelve months, see Table 10. Moreover, moderately positive correlations were found for sustainable and sufficient past behavior and weak correlations for income

(negative), and gender (positive for female gender). It must be noted that the variables for past behavior and gender were dummy-coded and hence the Pearson's correlation was a point-biserial correlation. The latter must be interpreted with caution since the variables were dichotomous and not metrically scaled. No significant correlations with intention could be seen for social desirability scales, age, and education. Also, diverse gender did not show significant correlations with intention but is of minor value as the subsample consisted of five participants. Consequently, these variables without significant correlations were not included in the final regression model.

Other remarkable correlations were found between intention with attitude and subjective norm, and accordingly between AT and SN with all control variables that turned out to be relevant for intention, see Table 10. An exception is sufficient past behavior, which was not significantly correlated with SN despite its correlation with AT and INT. No significant relation could be found for intention with perceived behavioral control. Interestingly, a high perceived behavioral control was particularly associated with young age and a low number of flights in the past twelve months.

Table 10

Bivariate correlations between TPB and control variables

Variable	<i>n</i>	<i>M</i>	<i>SD</i>	1	2	3	4
1. Intention	237	3.54	1.13	-			
2. Attitude	233	3.77	.92	.71***	-		
3. Subjective norm	229	3.15	1.08	.43***	.44***	-	
4. Perceived behavioral control	238	4.46	.72	.02	.12	.04	-
5. Number of flights	238	1.97	2.47	-.39***	-.53***	-.23***	-.23***
6a. Sufficient past behavior ^a	238	-	-	.37***	.38***	.12	.12
6b. Sustainable past behavior ^b	238	-	-	.40**	.32**	.24**	-.02
7. Environmental behavior	238	2.70	1.04	.50***	.49***	.42***	.03
8. Social Desirability PQ+	238	3.68	.59	-.05	-.06	.01	.09
9. Social Desirability NQ-	238	4.10	.75	.10	.10	.01	.12
10. Age	238	38.37	16.59	.03	.12	-.02	-.28***
11a. Female gender ^c	238	-	-	.17**	.19**	.14*	.09
11b. Diverse gender ^d	238	-	-	.07	.03	.13*	-.05
12. Income	238	3.68	1.89	-.20**	-.18**	-.24***	-.13
13. Education	236	5.59	1.52	-.01	-.02	-.12	-.04

Note. All correlations were calculated with Pearson's *r* except for income and education, whose correlations are calculated using the Spearman-Brown coefficient due to ordinal scaling.

^a 1 = Have flown less or not at all, 0 = Have flown more or continuously often.

^b 1 = Have flown less or not at all for sustainability reasons, 0 = Have flown more, continuously often, or less or not at all for other reasons.

^c 1 = Female, 0 = Diverse, male.

^d 1 = Diverse, 0 = Female, male.

* $p < .05$. ** $p < .01$. *** $p < .001$.

For the final regression model, the two-step hierarchical regression was calculated again without the outliers. While step one remained the same, only relevant control variables were entered in step two. As a result, TPB predictors accounted for 55.6 % of variance in intention, see Table 11. Attitude and subjective norm emerged as significant variables. A favorable (high) attitude towards reducing leisure air travel was able to predict a high intention to avoid leisure flights. Also, subjective norm had a positive, but small influence on the intention to avoid leisure air travel. In accordance with correlation analysis, perceived behavioral control did not influence the intention to avoid leisure air travel.

When relevant control variables were entered, the model accounted for additional 3.9 % of variance in intentions - a small but statistically significant increase that resulted from sustainable past behavior: Whether participants flew less or not at all for sustainability purposes explained 28.0 % of the variability observed in intention to avoid leisure air travel. Furthermore, subjective norm was no longer significant in combination with the other variables. Accordingly, the variables in the second model were able to account for 59.6 % of variance in intention.

Table 11

Final hierarchical regression of TPB predictors and significant control variables on intention

Step	Variable entered	Step 1				Step 2			
		B	SE	β	p	B	SE	β	p
	(constant)	.38	.37		.31	.74	.45		.10
1	Attitude	.85***	.06	.69***	<.001	.71***	.08	.57***	<.001
	Subjective norm	.12 [*]	.05	.12 [*]	.03	.08	.06	.08	.13
	Perceived behavioral control	-.10	.07	-.06	.17	-.10	.07	-.06	.18
2	Number of flights					-.01	.03	-.02	.78
	Sufficient past behavior ^a					.14	.14	.06	.32
	Sustainable past behavior ^b					.28 [*]	.13	.12 [*]	.04
	Environmental behavior					.10	.06	.09	.10
	Female gender ^c					.03	.11	.01	.82
	Income					-.04	.03	-.07	.13
	R^2	.56***				.60***			
	R^2_{Adj}	.55***				.58***			
	F	91.55***				34.74***			
	ΔR^2					.04**			
	ΔF					3.37**			

Note. $n = 222$; only variables with complete data were included.

^a 1 = Have flown less or not at all, 0 = Have flown more or continuously often.

^b 1 = Have flown less or not at all for sustainability reasons, 0 = Have flown more, continuously often, or less or not at all for other reasons.

^c 1 = Female, 0 = Diverse, male.

* $p < .05$. ** $p < .01$. *** $p < .001$

5 Discussion

5.1 Summary and interpretation of the results

The first part of the study examined the effect of a sufficiency-promoting campaign on TPB variables. In line with hypothesis II, see Table 12, the experimental group which was exposed to the sufficiency-promoting campaign had a significantly different attitude towards reducing leisure air travel with a higher mean than the control group.

While this part confirms findings of Hwang et al. (2016) and Frick et al. (2021), it does not provide support for the effect of a sufficiency-promoting stimulus on intention as shown in prior studies (Hwang et al., 2016; Ramirez et al., 2017), see Table 2. However, the stimulus also did not cause backfiring effects on intentions as shown in the example by Elsner (2023), where it was concluded that sufficiency-promoting campaigns might even enhance consumption. Instead, it fails to influence intentions at all as in a prior study of Berneiser et al. (2022) with informational stimuli. Moreover, this study could not confirm effects of the sufficiency-promoting stimulus on perceived behavioral control, which were observed by Berneiser et al. (2022) and Dütschke et al. (2022). Contrary to the expectations based on the TPB, subjective norm was not influenced by the campaign, leading to a rejection of hypothesis III.

Table 12

Overview of hypotheses and results

	Hypothesis	Result
I	Participants exposed to a sufficiency-promoting stimulus (group 1) have a higher intention to refrain from leisure air travel in comparison to participants not exposed to such a stimulus (group 2).	No
II	Participants exposed to a sufficiency-promoting stimulus (group 1) have a more positive attitude towards reducing air travel in comparison to participants not exposed to such a stimulus (group 2).	Yes
III	Participants exposed to a sufficiency-promoting stimulus (group 1) have a more positive subjective norm towards reducing air travel in comparison to participants not exposed to such a stimulus (group 2).	No
IV	Participants exposed to a sufficiency-promoting stimulus (group 1) have a higher level of perceived behavioral control in comparison to participants not exposed to such a stimulus (group 2).	No
V	The intention to reduce or avoid from leisure air travel can be predicted by the attitude towards reducing or avoiding air travel.	Yes
VI	The intention to reduce or avoid leisure air travel can be predicted by the subjective norm towards reducing or avoiding air travel.	Yes / no
VII	The intention to reduce or avoid leisure air travel can be predicted by the perceived behavioral control over reducing or avoiding air travel.	No

Overall, this points out that the effect of the sufficiency-promoting campaign was generally positive; however, it was not enough to effectively tackle intentions. For example, the campaign could have been more effective if participants were exposed more often: Advertising research has shown that the effect of a campaign initially increases and reaches a maximum effect after the seventh exposure, which is known as the so-called

“repeated exposure effect” (Lee & Briley, 2005). Also, it has been shown that moving from static banners to interactive audiovisual advertisements, enhancing emotional and sensory appeal and implementing interactivity increases effects of advertisements (Belanche et al., 2017; Krishna et al., 2016; Sundar & Kim, 2005). Consequently, the campaign used in this thesis may not have been very effective because it was designed as a static picture and thus may have created only low emotional involvement.

Another possible explanation is the so-called “green gap” (ElHaffar et al., 2020, p. 1) - an attitude-intention-behavior gap that has occurred especially when the TPB is applied to explain environmental behavior (Echegaray & Hansstein, 2017; Tarfaoui & Zkim, 2017). It was defined by ElHaffar et al. (2020, p. 3) as “the inconsistency between what the individual says regarding his/her growing concern about the environmental problems and what he/she does in terms of actions, behaviors, and contributions to lessen the consequences of these problems”. Accordingly, people’s positive evaluation towards reducing air travel did not translate into intending behavioral change. This can cause “cognitive dissonance, [i.e.] an unpleasant state aroused by awareness of inconsistent cognitions” (Vargas & Yoon, 2004, p. 53), especially in the field of air travel (Davison et al., 2014). While Hoffmann and Wittmer (2021) argued that this gap would be a transitional stage, several other studies suggest that it would remain: attitudes do often not translate into intentions, and intentions, in turn, not into actual behavior (Alcock et al., 2017; Geiger et al., 2018; Lassen, 2010). Although Higham et al. (2016) pointed out that tackling actual behavior requires structural changes, they argued that soft bottom-up measures were necessary to raise awareness and inform about impacts of aviation. According to them, the success of a campaign is thus not measured in its effectiveness on behavior, but rather in generally attracting attention on the topic (Higham et al., 2016). In that way, given the change in attitude, the findings of this thesis could be considered a success even though there was no effect on intentions and behavior was not even measured due to a limited scope.

In the second part of the study, the ability of the TPB to explain intentions to reduce leisure air travel was tested. Overall, the findings of this study show a very high explanatory power that is much higher than in most other studies, in which TPB only accounts for up to 40 % of variance in intention (Armitage & Conner, 2001; Berneiser et al., 2022). As such, it supports findings of Morten et al. (2018) that the TPB is suited to predict intentions to reduce leisure air travel.

However, most of the explanatory power resulted from attitude, which is consistent with hypothesis V, see Table 12. This means that the intention to reduce or avoid from leisure air travel can be predicted by a favorable attitude towards avoiding and reducing air travel. As such, this outcome is congruent to prior research highlighting the influence of attitude on sufficiency-oriented intentions (Berneiser et al., 2022; Hwang et al., 2016; Morten et al., 2018; Ramirez et al., 2017). The role of attitude has also been emphasized before regarding other pro-environmental behaviors and purchase intentions (La Barbera et al., 2014; Liu et al., 2020; Trivedi et al., 2018; Yan et al., 2012).

Subjective norm had a significant influence on intention; but the variable explained only 12 % of variance and was only significant in the TPB model without further control variables. Thus, hypothesis VI must be partly rejected due to its small effect. As such, this outcome contradicts prior findings: In the study of Morten et al. (2018), SN was a significant predictor on intentions to reduce air travel within the TPB model but also in combination with other variables. In the field of advertisement for eco-fashion, SN was significant for purchase intentions as well; however, it had a very small influence too (Yan et al., 2012).

A possible explanation for the low significance of SN was suggested by La Barbera and Ajzen (2020): In their studies, they showed that PBC moderates the effects of AT and SN on intention. Accordingly, “whereas greater PBC tends to increase the relative importance of attitude in the prediction of intention, it tends to decrease the importance of subjective norm” (La Barbera & Ajzen, 2020, pp. 412–413). Since PBC had a high mean score and limited variability, it may have weakened the effect of SN on intentions. Moreover, as already suggested by Morten et al. (2018), the high and hardly varying scores may explain the lacking explanatory power found in this study that led to a clear rejection of hypothesis VII, see Table 12.

While the lacking significance of PBC contradicts prior findings (Berneiser et al., 2022; Dütschke et al., 2022; Robinson & Smith, 2002), it also indicates a large confidence of participants in determining whether to use air travel or not. Accordingly, people do not feel forced to use leisure air travel by external pressures; they may know about alternatives and feel empowered to decide but might not prefer other travel modes.

Sustainable past behavior, however, was found to significantly predict intentions, see Table 11: Respondents who have refrained from leisure air travel for sustainability

reasons before are likely to remain their behavior and intend to avoid flying in the future. Interestingly, sufficient past behavior for other reasons, for example, having young children, being afraid of air travel, or preferring different travel modes, did not significantly predict intentions. This means that past behavior only had an impact when it was subject to a deliberate, value-based decision-making process. Overall, this finding supports the suggestion of prior studies to include past behavior in a model that explains intentions (Bagozzi & Warshaw, 1990; Ouellette & Wood, 1998; Rise et al., 2010; Robinson & Smith, 2002), especially in the field of air travel and sustainability (Hoffmann & Wittmer, 2021; Morten et al., 2018).

Sociodemographic variables were not significant when entered in the regression model, which is in line with the findings of Dütschke et al. (2022). In contrast to results from Seegebarth et al. (2023), environmental behavior did not have predictive power in combination with the other control variables on intentions to avoid leisure air travel, although it was strongly correlated with it.

Overall, it is questionable whether the TPB is suitable if most explanatory power resulted from one variable; especially when a significant variable - past behavior - is not included in the theory. However, Ajzen (1991) himself stated that the theory can be complemented by additional variables as long as they increase explained variance.

5.2 Theoretical contributions

This thesis provides four major contributions to the research field. First, it combines prior research on sufficiency-promoting campaigns with the field of leisure air travel, which is highly relevant considering the emissions of aviation. Second, it supports findings of studies who concluded that such campaigns influence consumers' attitudes. Third, the study shows that addressing attitudes towards reducing air travel is key to influence behavioral intentions, which supports prior findings about pro-environmental or sufficient behavior. And lastly, it recommends expanding the Theory of Planned Behavior by past behavior as a fourth variable predicting intentions in the field of air travel.

5.3 Limitations and future research directions

However, the findings are subject to at least four limitations: The most significant is that an effect on behavioral intentions could not be achieved in the study. As pointed out above, this could be due to the stimulus itself or due to the limited exposure of participants. Therefore, this thesis emphasizes the need to study more sophisticated, long-

term interventions using various techniques and medias. This should show if the change in attitude can be increased to a point where intentions are significantly influenced as well, or if there is a persisting gap between attitude and intentions. Moreover, future research should aim to investigate actual behavior in a longitudinal design.

Also, it must be considered that the experimental group had a lower average number of flights in the past twelve months than the control group, see Table 6, and a higher share of people who acted sufficiently in the past, see Figure 3. This might have influenced attitudes of the experimental group towards reducing air travel, which were more positive than attitudes of the control group. This needs to be kept in mind when evaluating the results and should be considered in further research. Also, future studies could focus on investigating effects on participants who have not yet reduced air travel.

Thirdly, it must be noted that the sample investigated had relatively high levels of social desirability. Although its influence on intention was controlled for in the regression analysis, it might have influenced participants' answers on other variables, such as attitude: Respondents may have been reminded of feelings of "flight shame" by the stimulus and thus evaluated reducing or avoiding air travel more negatively. Although this might be seen as part of the intended effect to influence their attitude, it might have been a primarily short-term reaction, where participants wanted to perform well in the survey.

The fourth limitation stems from the sample used in this study as it is not representative for the German population: Looking at sociodemographic data, a particular high level of education and an overrepresentation of low-income participants can be seen. Most likely, participants were either still in high education with low or no own income or in graduate profession. Also, environmental behavior was slightly higher than in the German population; however, the values for environmental behavior must be compared with caution because two items were excluded from the original scale. Whereas the sample is not representative for Germany, it consists of a possible target group for air travel sufficiency campaigns: Especially people of young age and high education, aside from high income, are known for having disproportionately high travel emissions (Aamaas et al., 2013, p. 281; Dütschke et al., 2022; Hoffmann & Wittmer, 2021; Lacroix, 2018). Nevertheless, the limited informative value of a sample compiled using convenience sampling must be taken into account.

Additionally, findings from one cultural background cannot be generalized to other parts of the world: Especially in marketing campaigns, cultural differences need to be considered in aligning verbal and non-verbal messages such as symbolic signs with local values and lifestyles (Joseph, 2023; Kim & Johnson, 2013; van Raaij, 1997). In that regard, it is also important to consider the originators of leisure air travel emissions: Not only do 1 % of all people cause 50 % of global aviation emissions, there are also dynamic changes that need to be taken into account (European Federation for Transport and Environment AISBL, 2021). While OECD countries were responsible for 43 % of global passenger movements in 2015, their share will decline to 24 % by 2050, and other nations such as China and India become increasingly relevant (International Transport Forum [ITF], 2019). Consequently, future research is needed to better understand how cultural differences can impact the effectiveness of sufficiency-promotion. Additionally, it might be helpful to differentiate between different social milieus as it was done in a study by Kleinhüchelkotten (2002): She investigated how the potential for resonance of sufficiency strategies varies across social milieus in Germany.

Lastly, this thesis is written under the assumption that sufficiency strategies are actually able to achieve an absolute reduction in resource and energy consumption. Since there has been criticism pointing out possible backfiring or rebound effects, i.e. savings from travel mode changes are spent elsewhere, further research is needed to study such dynamics on a broad level (Schneidewind, 2014).

5.4 Practical implications

The findings of this study provide several practical implications. Above all, the results indicate that it is important to create a positive attitude towards reducing leisure air travel when designing a sufficiency-promoting campaign. More specifically, campaigns should present the reduction of leisure air travel as better, more useful and beneficial, pleasant and attractive. Especially nudging and goal-framing techniques seem to be a promising approach to make people reassess their travel mode for leisure purposes: By comparing two destinations in certain aspects, campaigns can reframe the environmentally friendly option in a way that is compatible or beneficial for personal benefits, for example, in terms of duration and costs. Lastly, there is high potential in addressing those who have not yet deliberately acted sufficiently for sustainability reasons.

6 Conclusion

This thesis investigated the effects of a sufficiency-promoting campaign on intentions to reduce or avoid leisure flights. Three major findings can be stated: The stimulus used in this study was able to create a more positive attitude towards reducing air travel for leisure purposes among the participants, and in turn, attitude could significantly predict intentions to avoid or reduce flying. Moreover, sufficient past behavior for sustainability purposes was found to have a significant influence on behavioral intentions. However, the fictional campaign used in this thesis was not able to increase intentions.

While this study emphasizes that addressing attitude is key for successfully changing people's perception of sufficient air travel behavior, more research is needed to find out if campaigns are also able to enhance intentions and actual behavior.

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Appendix A Questionnaire

*Text in italics was not displayed in the survey and is used for clarity (codes of variables, items, conditions). Questions with * were mandatory.*

[Introduction]

Liebe/r Teilnehmer/in,

herzlich willkommen zur Online-Umfrage zur **Zukunft von Flugreisen**. Die Teilnahme dauert maximal 10-15 Minuten.

Vielen Dank, dass Sie sich die Zeit nehmen, die Fragen zu beantworten. Damit tragen Sie maßgeblich zur Forschung im Rahmen meiner Bachelorarbeit an der Leuphana Universität Lüneburg bei.

Bitte beantworten Sie die Fragen so ehrlich wie möglich. Ihre Angaben sind anonymisiert und werden vertraulich behandelt. Sollten Sie Fragen oder Unklarheiten haben, zögern Sie nicht, mich zu kontaktieren unter maja.c.hoernstein@stud.leuphana.de.

Mit freundlichen Grüßen,
Maja Hörnstein

Question 1 [NF]: Bitte geben Sie an, wie viele Flugreisen Sie in den letzten 12 Monaten zu privaten Zwecken unternommen haben. (Hin- und Rückreise zählen dabei getrennt als zwei Flüge. Geschäftliche Reisen werden nicht gezählt.)*

Inlandsflugreisen	_____	[domestic]
Flugreisen innerhalb eines Kontinents	_____	[continent]
Interkontinental-Flugreisen	_____	[acrosscontij]

Entscheidend sind nur Start- und Zielflughafen der gesamten Reise, nicht die Anzahl Flugetappen. (Beispiel: Ein Flug von Frankfurt nach Australien mit Stopover in Singapur zählt als eine interkontinentale Flugreise, obwohl diese zwei Flüge beinhaltet.)

Question 2 [PB]: Bitte beenden Sie den folgenden Satz: Im Vergleich zu früher bin ich zu Freizeit- und Urlaubszwecken in letzter Zeit... (Diese Aussage bezieht sich nicht auf geschäftliche Reisen.)*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- ...mehr geflogen. [1]
- ...weniger geflogen. [2]
- ...gleich oft geflogen. [3]
- Sonstiges: _____ [other]

Question 2a [PB2]: Warum sind Sie in letzter Zeit weniger geflogen als früher?* [This question does only appear when question 2 = „weniger geflogen“]

Bitte geben Sie Ihre Antwort hier ein:

Question 2b [PB3]: Warum fliegen Sie grundsätzlich nicht?* [This question does only appear when question 1 = 0 and question 2 = „gleich oft geflogen“]

Bitte geben Sie Ihre Antwort hier ein:

Question 3 [EB]: Bitte geben Sie an, wie sehr die folgenden Aussagen auf Sie zutreffen.*

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

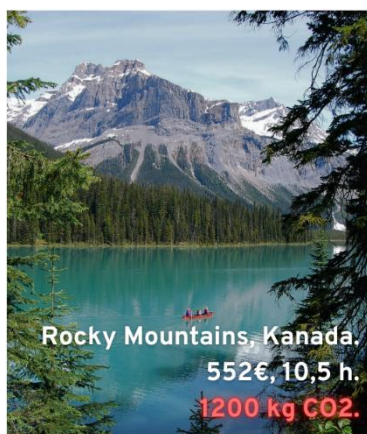
	Nie (0)	2	3	4	5	Im- mer (5)	Kann ich nicht beant- worten
Ich kaufe Lebensmittel aus kontrolliert-biologischem Anbau. [EB1]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beim Einkaufen wähle ich Produkte mit Umweltsiegel (z.B. Blauer Engel, EU Biosiegel oder EU Ecolabel). [EB2]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Zu den Hauptmahlzeiten esse ich Fleisch. [EB3; inverse coded]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Für meine alltäglichen Wege benutze ich das Fahrrad, öffentliche Verkehrsmittel oder gehe zu Fuß. [EB4]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Beim Kauf von Haushaltsgeräten wähle ich besonders energieeffiziente Geräte (A+++ oder A++ Energieeffizienzsigel). [EB5]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bitte wählen Sie für jede Aussage auf der linken Seite ein Feld von "Nie" (0) und bis "Immer" (5).

Question 4 [EB2]: Bitte geben Sie an, wie sehr die folgenden Aussagen auf Sie zutreffen.*

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Ja (5)	Nein (0)	Kann ich nicht beantworten
Ich spende Geld für Umwelt- oder Naturschutzgruppen. [EB6]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich engagiere mich aktiv für den Umwelt- und Naturschutz. [EB7]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich beziehe Ökostrom. [EB8]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

{if(is_empty(Random), rand(1,2), Random)}**[Teilnehmende werden zwei randomisierten Gruppen zugewiesen]***Question 5 [Stimulus]: Stellen Sie sich vor, Sie sehen die folgende Kampagne an einer Werbefläche. Lassen Sie es auf sich wirken.* [Nur Teilnehmende der randomisierten Gruppe 1 sehen diese Frage]****Spar dir den Flug - für Dich und die Natur.***berechnet ab Frankfurt am Main.

Bitte wählen Sie nur eine der folgenden Antworten aus:

- Ich habe mir die Werbeanzeige angesehen. [y]
 Ich konnte keine Werbeanzeige sehen. [n]
 Sonstiges: _____ [other]

Question 6 [AT]: Bitte beenden Sie den folgenden Satz: In Zukunft weniger private Flugreisen zu unternehmen, fände ich...*

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	1	2	3	4	5	Kann ich nicht beantworten
Sehr schlecht (1) - Sehr gut (5) [AT1]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sehr schädlich (1) - Sehr nützlich (5) [AT2]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sehr sinnlos (1) - Sehr sinnvoll (5) [AT3]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sehr unangenehm (1) - Sehr angenehm (5) [AT4]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Sehr unattraktiv (1) - Sehr verlockend (5) [AT5]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Sie können für jedes Begriffspaar jeweils eine Option von 1-5 auswählen, um den obenstehenden Satz zu beenden.

Question 7 [TPB]: Bitte geben Sie an, wie sehr die folgenden Aussagen auf Sie zutreffen. Wichtig: Alle Aussagen beziehen sich auf private Flugreisen (zu Freizeit- und Urlaubszwecken).*

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft gar nicht zu (1)	2	3	4	Trifft voll und ganz zu (5)	Kann ich nicht beantworten
Die meisten Menschen, die mir wichtig sind, finden, dass man aus Umweltschutzgründen möglichst wenig fliegen sollte. [SN1]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Die meisten Menschen, deren Meinung mir wichtig ist, vermeiden Flugreisen aus Umweltschutzgründen. [SN2]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich kann selbst beeinflussen, ob ich in Zukunft mehr oder weniger fliegen werde. [PBC1]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es liegt in meiner Macht zu bestimmen, wie oft ich Flugreisen unternehmen werde. [PBC2]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Äußere Faktoren bestimmen, wie viel ich in Zukunft fliegen werde. [PBC3; inverse coded]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich beabsichtige, Flugreisen zukünftig aus Nachhaltigkeitsgründen zu vermeiden. [INT1]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe vor, aus Umweltschutzgründen selten oder weniger zu fliegen. [INT2]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe vor, zukünftig in etwa gleich viel oder mehr zu fliegen. [INT3; inverse coded]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bitte wählen Sie für jede Aussage auf der linken Seite ein Feld von "Trifft gar nicht zu (1)" und bis "Trifft voll und ganz zu (5)".

Question 8 [SD]: Bitte geben Sie an, wie sehr die folgenden Aussagen auf Sie zutreffen.*

Bitte wählen Sie die zutreffende Antwort für jeden Punkt aus:

	Trifft gar nicht zu (1)	2	3	4	Trifft voll und ganz zu (5)	Kann ich nicht beantworten
Im Streit bleibe ich stets sachlich und objektiv. [PQ1]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Auch wenn ich selbst gestresst bin, handle ich andere immer freundlich und zuvorkommend. [PQ2]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Wenn ich mich mit jemandem unterhalte, höre ich ihm immer aufmerksam zu. [PQ3]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Es ist schon mal vorgekommen, dass ich jemanden ausgenutzt habe. [NQ1; inverse coded]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ich habe schon mal Müll einfach in die Landschaft oder auf die Straße geworfen. [NQ2; inverse coded]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Manchmal helfe ich jemandem nur, wenn ich eine Gegenleistung erwarten kann. [NQ3; inverse coded]	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Bitte wählen Sie für jede Aussage auf der linken Seite ein Feld von "Trifft gar nicht zu (1)" und bis "Trifft voll und ganz zu (5)".

Fast geschafft! Zum Schluss bräuchte ich noch einige persönliche Informationen von Ihnen. Auch diese sind selbstverständlich anonymisiert.**Question 9 [D1]: Bitte geben Sie Ihr Geburtsjahr an.***

Ihre Antwort muss zwischen 1900 und 2013 liegen.

In diesem Feld darf nur ein ganzzahliger Wert eingetragen werden.

Bitte geben Sie Ihre Antwort hier ein: _____

Question 10 [D2]: Mit welchem Geschlecht identifizieren Sie sich?*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- weiblich [f]
 männlich [m]
 divers [d]

Question 11 [D3]: Wie hoch ist Ihr monatliches Haushaltsnettoeinkommen?*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- Unter 1.249 Euro [1]
 1.250 bis 1.749 Euro [2]
 1.750 bis 2.499 Euro [3]
 2.500 bis 3.499 Euro [4]
 3.500 bis 4.999 Euro [5]
 5.000 Euro und mehr [6]

Das monatliche Haushaltsnettoeinkommen ist die **Summe der monatlichen Nettoeinkommen aller Haushaltsmitglieder** (auch bei vorübergehender Abwesenheit). **Nicht dazu gehören längerfristig außerhalb lebende Personen (z. B. Studierende, die am Studienort wohnen), nur zu Besuch anwesende Personen, Arbeitskräfte und Untermieter.**

Das Nettoeinkommen errechnet sich aus **Bruttoeinkünften abzüglich Steuern, Beiträgen zur Kranken-, Pflege-, Arbeitslosen- und gesetzlichen Rentenversicherung.** (Beruflicher Lohn, Rente, Weihnachtsgeld, Urlaubsgeld, Einkünfte aus Vermietung/Verpachtung sowie aus Vermögen, Unterhaltszahlungen, BAföG, Stipendien, Sonderzahlungen (z.B. Abfindungen), öffentliche Zahlungen (Wohngeld, Elterngeld, Arbeitslosengeld u. Ä.), Einnahmen aus Nebenerwerbstätigkeit.

Question 12 [D4]: Was ist Ihr höchster Bildungsabschluss?*

Bitte wählen Sie nur eine der folgenden Antworten aus:

- Schule beendet ohne Abschluss [1]
- Hauptschulabschluss (oder polytechnische Oberschule mit Abschluss 8./9. Klasse) [2]
- Realschulabschluss / Mittlere Reife (oder polytechnische Oberschule mit Abschluss 10. Klasse) [3]
- (Fach-)Abitur oder ein vergleichbarer Abschluss (Hochschul- beziehungsweise Fachhochschulreife) [4]
- Ausbildung [5]
- Bachelor [6]
- Master / Diplom [7]
- Promotion [8]
- Sonstiges: _____ [other]

Question 13 [Comment]: Für Anmerkungen zu Ihren Angaben können Sie dieses Feld nutzen.

Bitte geben Sie Ihre Antwort hier ein:

[End]

Vielen Dank, dass Sie sich die Zeit genommen haben, an der Umfrage teilzunehmen. Ihre Antworten sind äußerst wertvoll für meine Bachelorarbeit.

Ich würde mich sehr freuen, wenn Sie den Link zur Umfrage mit Ihrer Familie, Freunden und Bekannten teilen.

Damit andere Teilnehmende nicht beeinflusst werden, ist es wichtig, dass Sie keine Informationen über die Inhalte weitergeben.

Wenn Sie über die Ergebnisse meiner Arbeit informiert werden wollen oder sonstige Fragen oder Anmerkungen haben, kontaktieren Sie mich gerne unter maja.c.hoernstein@stud.leuphana.de.

Nochmals vielen Dank für Ihre Unterstützung!

Mit freundlichen Grüßen,
Maja Hörnstein

Appendix B Additional SPSS extract of internal consistency reliability analysis

Table B 1

Internal consistency reliability of scales before excluding items

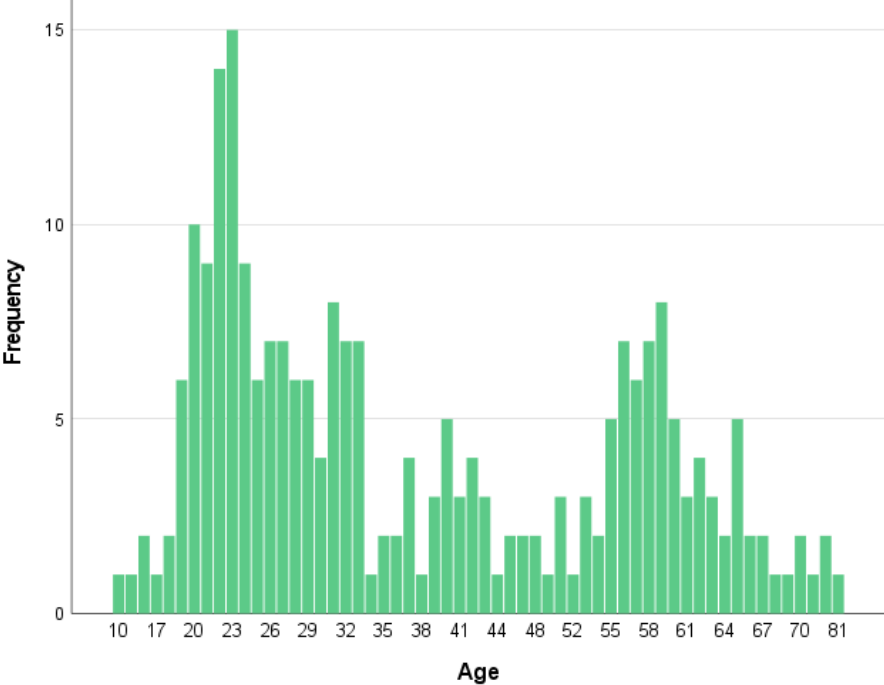
Scale	<i>n</i>	Cronbach's α	Spearman-Brown coefficient ρ	Corrected item-total correlations
Intention	215	.78		
INT1				.68
INT2				.73
INT3				.48
Attitude	206	.86		
AT1				.80
AT2				.58
AT3				.64
AT4				.67
AT5				.69
Subjective norm	214		.82	
SN1				.70
SN2				.70
Perceived behavioral control	223	.56		
PBC1				.47
PBC2				.47
PBC3				.27
Environmental behavior	160	.71		
EB1				.54
EB2				.55
EB3				.41
EB4				.30
EB5				.17
EB6				.52
EB7				.47
EB8				.20
Social Desirability PQ+	235	.57		
PQ1				.33
PQ2				.43
PQ3				.39
Social Desirability NQ-	226	.50		
NQ1				.34
NQ2				.30
NQ3				.33

Note. Names of items refer to codes used in the questionnaire, see Appendix A.

Appendix C SPSS extract of sociodemographic data

Figure C1

Age distribution of the sample



Appendix D Additional SPSS extracts to test for hypotheses I-IV

Table D1

Tests for normal distribution

Variable	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Intention	.10	225	<.001	.94	225	<.001
Attitude	.09	225	<.001	.94	225	<.001
Subjective norm	.12	225	<.001	.96	225	<.001
Perceived behavioral control	.30	225	<.001	.77	225	<.001

Figure D1

Histogram of intention with normal distribution curve

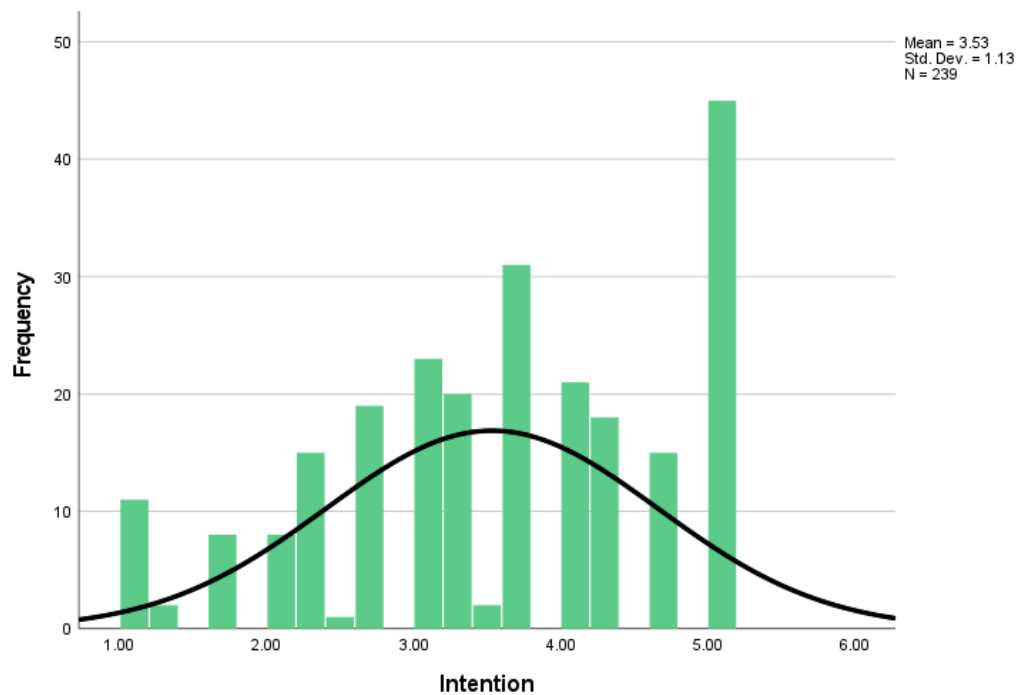


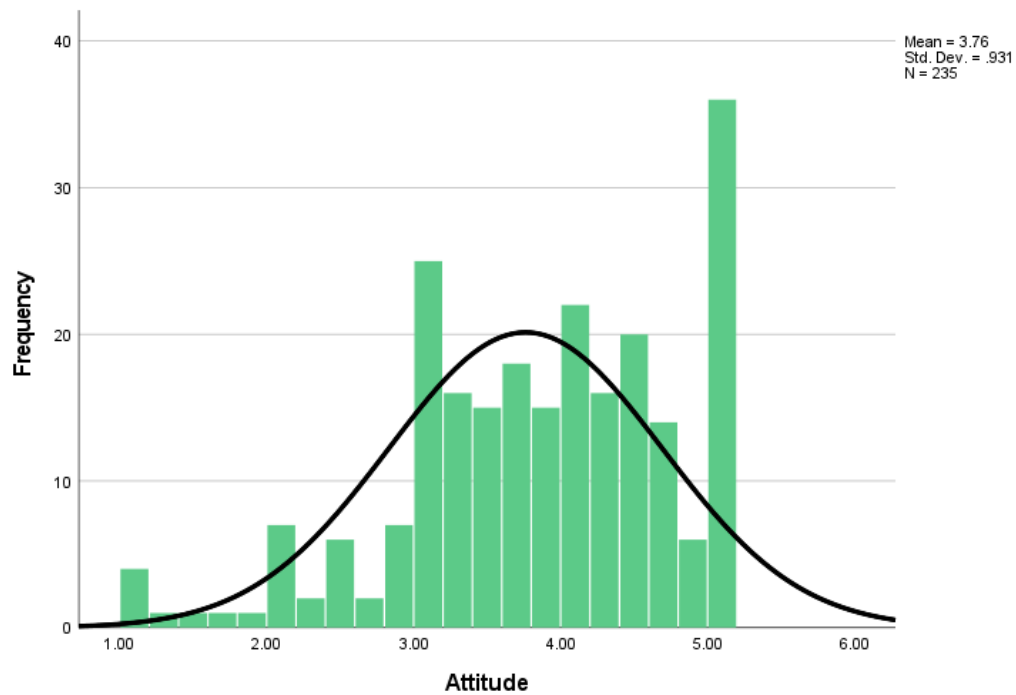
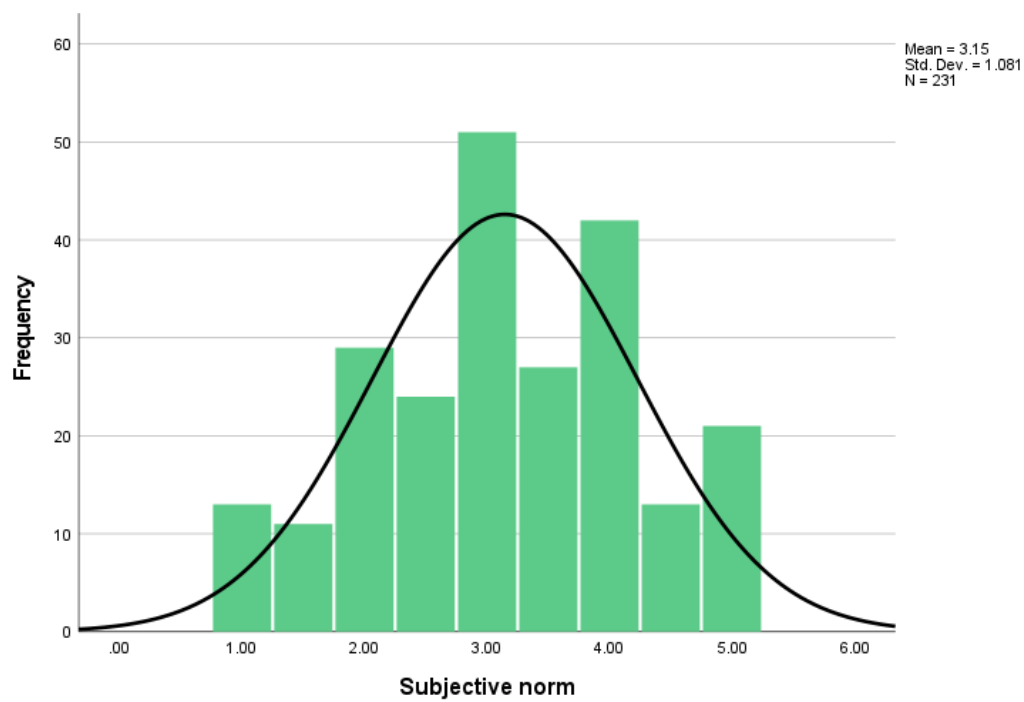
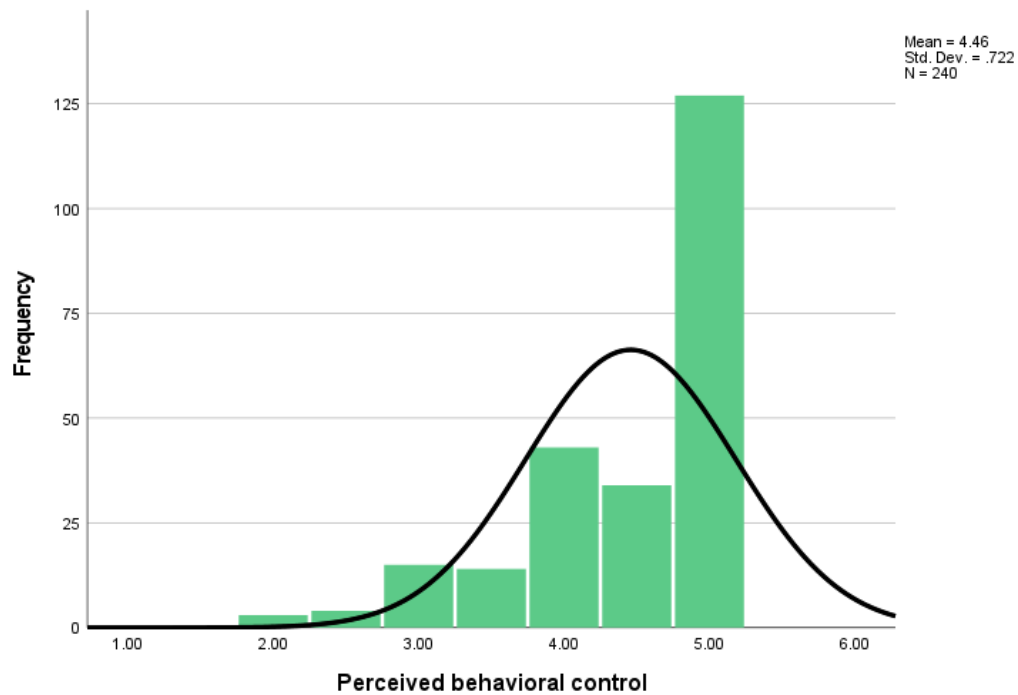
Figure D2*Histogram of attitude with normal distribution curve***Figure D3***Histogram of subjective norm with normal distribution curve*

Figure D4*Histogram of perceived behavioral control with normal distribution curve***Table D2***Two-Sample Kolmogorov-Smirnov test of TPB variables between groups*

		Intention (z-standardized)	Attitude (z-standardized)	Subjective norm (z-standardized)	Perceived behavioral control (z-standardized)
Most extreme differences	Absolute	.173	.208	.504	.208
	Positive	.060	.129	.049	.129
	Negative	-.173	-.208	-.504	-.208
Kolmogorov-Smirnov Z		1.340	1.114	1.586	3.906
Asymp. sig. (2-tailed)		.055	.167	.013	<.001

Table D3*Mann-Whitney U tests for TPB variables*

Variable	n	U	Z	p	Experimental group		Control group	
					M _{Rank}	Mdn	M _{Rank}	Mdn
Intention	239	6708.50	-0.77	.44	-	3.67	-	3.67
Attitude	235	5667.50	-2.35	.02	-	4.20	-	3.60
Subjective norm	231	6312.50	-0.68	.50	119.11	-	113.17	-
Perceived behavioral control	240	6915.00	-0.54	.59	122.84	-	118.38	-

Appendix E Additional SPSS extracts to test for hypotheses V-VII

Table E1

First hierarchical regression (including outliers) with all control variables and collinearity statistics

Step	Variable entered	Step 1						Step 2					
		B	SE	β	p	Tolerance	VIF	B	SE	β	p	Tolerance	VIF
	(constant)	.44	.39		.27			.66	.63		.30		
1	AT	.80***	.07	.65***	<.001	.75	1.33	.62***	.08	.50***	<.001	.52	1.94
	AN	.12*	.06	.11*	.04	.69	1.32	.07	.06	.07	.21	.68	1.48
	PBC	-.07	.07	-.04	.35	.99	1.01	-.08	.08	-.05	.27	.88	1.14
2	NF							-.03	.03	-.07	.25	.54	1.85
	Sufficient past behavior ^a							.21	.15	.09	.18	.49	2.04
	Sustainable past behavior ^b							.29	.14	.12	.04	.63	1.58
	EB							.12	.06	.11	.06	.62	1.62
	SD PQ+							.09	.10	.05	.36	.82	1.23
	SD NQ-							.05	.08	.03	.51	.80	1.25
	Age							<.001	<.001	-.04	.49	.66	1.51
	Female gender ^c							.05	.13	.02	.67	.78	1.29
	Diverse gender ^d							-.28	.42	-.03	.50	.86	1.16
	Income							-.05	.03	-.08	.14	.66	1.52
	Education							-.02	.10	-.01	.81	.84	1.19
	R ²	.51***						.58***					
	R ² _{Adj}	.51***						.55***					
	F	76.61***						20.20***					
	ΔR^2							.06**					
	ΔF							2.86**					

Note. $n = 223$; only variables with complete data were included.

^a 1 = Have flown less or not at all, 0 = Have flown more or continuously often.

^b 1 = Have flown less or not at all for sustainability reasons, 0 = Have flown more, continuously often, or less or not at all for other reasons.

^c 1 = Female, 0 = Diverse, male.

^d 1 = Diverse, 0 = Female, male.

* $p < .05$. ** $p < .01$. *** $p < .001$

Figure E1

Scatterplot of studentized residuals with unstandardized predicted value

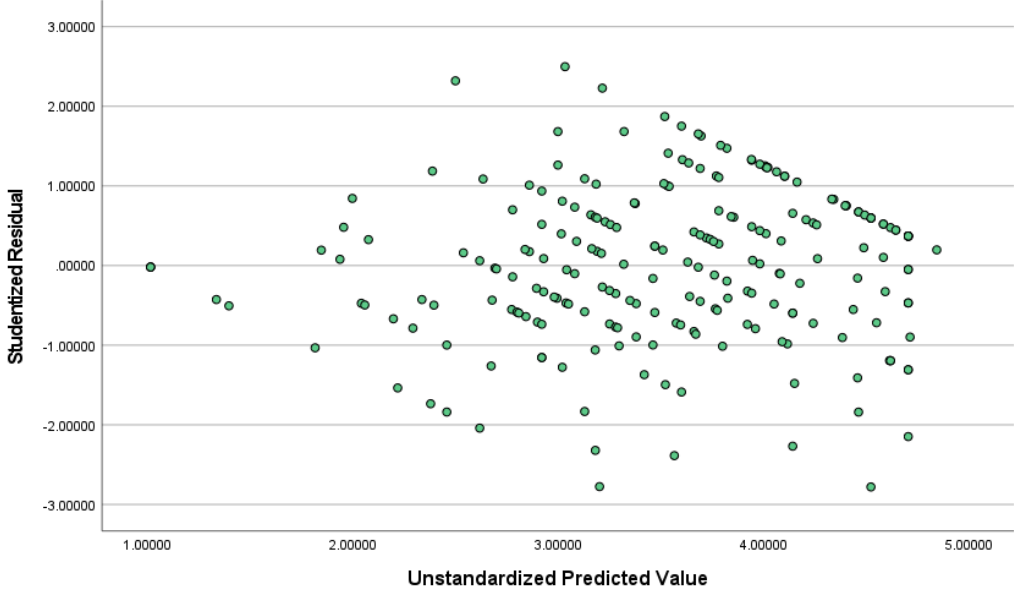


Figure E2

Histogram of standardized residuals

