To Fly or Not to Fly: Social Pressure and Informational Influence as Strategies to Reduce

Ambivalence

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Master Thesis – Applied Social Psychology

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Abstract

Despite growing global awareness of the factors influencing climate change, many people are still ambivalent when it comes to changing their environmental behavior. In this thesis, we look at how social pressure fares against informational influence as means to reduce ambivalence towards flying as a means of transportation. Social pressure is a relatively unexplored method when it comes to persuading ambivalent individuals. The study made use of a 1 x 3 experimental design, with a sample of $n = 76$ participants. Informational influence and social pressure were manipulated via blog articles that used informational versus a combination of normative and interpersonal cues, respectively. The results showed a significant effect for the social pressure to decrease objective ambivalence ($p = .042$, $d = -.36$) and a significant increase in ambivalence for informational influence ($p = .035$, $d = .37$). However, the results showed no overall difference between the two conditions and a control condition. Based on prior research, informational influence should have at least shown some ambivalence-reducing effects, therefore the discussion calls for a revision of aspects of the methodology in this paper. Future directions for studies expanding on the topic of ambivalence reduction and social pressure are discussed.

Keywords: ambivalence, social pressure, informational influence, persuasion, environmental behavior

To Fly or Not to Fly: Social Pressure and Informational Influence as Strategies to Reduce Ambivalence

Sitting in an air-conditioned airplane does seem more enticing than sitting in an antiquated train car in the middle of summer, with the display indicating 38°C inside. With its delays, the sometimes rowdy crowd, and the ever-increasing fares, traveling by train is not for everybody. This counts especially for long-distance trips. It thus seems much easier, cheaper, and cooler to travel by plane instead. However, planes are also significantly more damaging to the environment (European Environment Agency, 2020). For instance, "a return flight from London to Berlin emits around 0.6 tons CO_2 – three times the emissions saved from a year of recycling" (Timperley, 2020). If humans do not act, the thermometer inside the train, and especially the one outside of it, will keep on rising. Anthropogenic climate change is already showing even more fatal consequences, like rising sea levels, intense droughts, and more extreme weather changes (IPCC, 2014). Mitigating the consequences of climate change poses one of the major issues of our time. About 80% of people in advanced economies seem to be willing to make some or a lot of changes to help reduce the effects of climate change (Pew Research Center, 2021). Reducing one's flying can do a lot to reduce the carbon emissions of an individual and is thus a good starting point for behavioral changes. Some people have been swearing off flying because of its detrimental effects already (Saner, 2019), related to the emergence of the "flight shame" movement (see e.g., Gössling et al., 2020). Yet flying holds advantages that may influence individuals above and beyond their consideration for the environment - especially opposed to other methods of transportation. Nevertheless, for the sake of the environment, how can those that are on the verge be convinced to choose not to fly?

The ambivalent are found caught in-between arguments pro and contra changing their behavior. Ambivalence is the psychological state in which both strongly positive and negative associations coexist towards an attitude object (van Harreveld et al., 2015). Ambivalence has been shown to elicit discomfort, which is why individuals are motivated to

reduce ambivalence (van Harreveld et al., 2009). Individuals who are ambivalent reduce their ambivalence by seeking out information that may change their attitudes. These people are likely easier to persuaded to change their attitudes and behaviors to be more environmentally friendly, compared to people that have strong discordant univalent attitudes. Motivating people to change is often done by providing information. To change the attitudes of ambivalent people, however, solely providing information on the attitude object is not always the best option (Steg & DeGroot, 2019). In order to reduce ambivalence and change attitudes, there needs to be more insight into what other methods can affect ambivalent people. Prior research on voting behaviors have shown social pressure to be an interesting tool to change attitudes (Gerber et al., 2008; Mallinson & Hatemi, 2018).

The aim of this paper is therefore to investigate social pressure as a potential method of reducing ambivalence. We study how social pressure fares as a persuasive method against informational influence in reducing ambivalence. To the best of our knowledge, social pressure as such has not yet been used to reduce ambivalence. To test social pressure and informational influence, we will be looking at the ambivalent people who are neither fully pro-flying nor fully against it.

Ambivalence and Persuasion

Individuals experience ambivalence when they simultaneously hold positive and negative attitudes towards a topic, a goal, or any attitude object (Rothman et al., 2017). Subjective ambivalence, also known as felt ambivalence, makes one part of the construct of ambivalence. It comes closest to what could be described as an embodied experience of ambivalence, the experience of conflict and torn feelings, and psychological discomfort (Weng & DeMarree, 2019). Measuring subjective ambivalence helps in understanding the feelings that an attitude object elicits in individuals. Another aspect, objective ambivalence, refers to the coexistence of strong positive and negative evaluations of an attitude object (Rothman et al., 2017). Thus, the measure of objective ambivalence aids in understanding

where individuals stand or lean towards an issue. For the study outlined below, both subjective and objective ambivalence are going to be measured, as suggested by prior research (Federico, 2006). We expect this to result in a more differentiated idea of how participants perceive and feel about the issue.

The mixed feelings perceived by the ambivalent can elicit discomfort, and individuals are motivated to pay attention to stimuli that may resolve this conflict and discomfort (see MAID Model by Van Harreveld et al., 2009; Weng & DeMarree, 2019). These stimuli are for example information that can guide people in making an informed decision, or the advice or opinion of a close other (Collado et al., 2017). If such stimuli are provided externally with the intent to change opinions and attitudes, it is called persuasion (Wood, 2000). Inconsistent attitudes are less resistant to persuasion. As ambivalent attitudes are inherently inconsistent, due to their conflicting positive and negative evaluations, they are more susceptible to persuasive methods (Zembroian & Johar, 2007).

According to the major traditions within persuasion research, attitude change rests on people's motivation as well as abilities to process relevant information (see Wood, 2005). When it comes to ambivalence, research indicates that individuals are more prone to make use of systematic processing (Jonas et al., 1997; Maio et al., 1996; Van Harreveld et al., 2009). Systematic processing is the deliberative and careful processing of messages and information. One example of this is a study in which participants were either exposed to a strong or a weak message about a minority group (Maio et al., 1996). They hypothesized that the level of ambivalence and message strength should interact to determine the effect of a message on acceptance of the opinion expressed in the message. And indeed, the stronger persuasive messages were received by the ambivalent attitude holders and ultimately resulted in reduced feelings of ambivalence. Thus, given that we only included participants with ambivalent attitudes towards flying, they should be open to persuasive attempts. The stronger the message, the more likely participants are to experience reduced ambivalence.

Informational Influence

Information provision is perhaps the most common method used to persuade and change behavior, albeit not the most successful one (Steg & DeGroot, 2019). Informational influence can generally be referred to as the process that challenges formerly assumed beliefs and promote change (APA Dictionary of Psychology, n.d.). Informational influence can be prompted by, for instance, communication or exposure to information, and can be tailored to the population it addresses (Abrahamse et al., 2007).

New information which is relevant to an attitude object may be functional in reducing ambivalence (Van Harreveld et al., 2009). Interest in seeking out attitude-relevant information is primarily seen in individuals high in subjective ambivalence (DeMarree et al., 2014). Some factors that influence the uptake and effectiveness of informational influence are the quality (Petty & Cacioppo, 1986) and the usefulness (Sussmann & Siegel, 2003) of the message. One line of research (Clark et al., 2008) showed that ambivalent attitude holders may be motivated to raise the processing of concordant, pro-attitudinal information. In the study, participants were provided with different messages, rather than choosing themselves what kind of information to seek out. Participants high in ambivalence toward the attitude object were more likely to choose and extensively process pro-attitudinal messages, rather than those containing discordant, counter-attitudinal information. Similarly, one study (Fischer et al., 2005) showed that when provided with a limited amount of information, ambivalent attitude holders were more likely to select attitude-consistent information. What this suggests for our study is that we can expect participants to show ambivalence reductions, especially in those participants who are already pro-attitudinal, in our case, more pro-environmental. Engaging with the informational influence manipulation might topple them into a pro-attitudinal state, reducing their ambivalence.

Nevertheless, it is known that information alone is not the most effective way to persuade (Schultz, 1999). When it comes to the real-life state of the world, it seems as if the

existing informational strategies to persuade people into thinking and behaving more environmentally friendly are not working to the extent to get enough people to reduce their ambivalence. To increase the chances of reducing ambivalence among the population, it is necessary to investigate other options. This is where social pressure comes in.

Social Pressure

Normative information is a promising tool for encouraging pro-environmental behavior (Cialdini, 2003). It comprises information on the opinion or behavior of others. Evidence suggests that ambivalent attitude holders are also more open to socially derived information about relevant others' attitudes and behaviors than their non-ambivalent counterparts (Hodson et al., 2001). This goes hand in hand with research that shows that individuals' pro-environmental behavior is influenced by the actions and expectations of relevant others (Collado et al., 2017). Moreover, those others may act as reference points indicating what is appropriate or correct (Levitan, 2018). With the possibility of risking disapproval by relevant groups when not conforming to their standards (Cialdini & Goldstein, 2004), there is a strong incentive to listen to normative and interpersonal appeals. The power of others in attitude (re-)formation is not to be underestimated.

Thus, one reasonable expectation for the ambivalent would therefore be that social pressure could persuade those that have not been persuaded by more traditional means. Social pressure is the combined force of normative, interpersonal, and informative influence exerted by a group or individuals on other groups or individuals (APA Dictionary of Psychology, n.d.). In academic literature, the usage of social pressure is prevalent in studies on voting behavior (see e.g., Gerber et al., 2008; Panagopoulos, 2010; Rogers et al., 2017). There, for instance, research has found that social pressure is a potent tool in motivating political participation (Gerber et al., 2008). In a study aiming at understanding the effects of information and social pressure on political opinion, Mallinson and Hatemi (2018) found that while most people did react to a combination of information and social pressure, social

pressure alone served as a motivation to change opinions for 10% of the participants. Social pressure thus qualifies itself as a potential method to change attitudes even for those that show no reaction to informational influence.

Despite evidence pointing towards the effectiveness of normative and interpersonal influences' persuasiveness, there is not much research on the relationship between ambivalence and social pressure, which makes it difficult to predict just in what direction and with what strength social pressure impacts ambivalence. In the current study, we thus estimate a conservative effect of social pressure compared to informational influence. Further, what little research on social pressure exists, lacks an approach to manipulate social pressure in a way that would advance our research question. In political-psychological research on voting behaviors, social pressure is often operationalized as messages about others, setting neighbors' behavior as a norm (see e.g., Gerber et al., 2008). As this is difficult to operationalize in an online study, our motivation instead followed in the footsteps of other manipulations by making use of wording and thematic cues (see Maio et al., 1996; O'Gorman et al., 2008).

The Present Research

The aim of this paper is to investigate how individuals' ambivalence can be reduced, which could help with changing their attitudes and behaviors towards more pro-environmental behaviors. We are therefore going to compare how social pressure fares against informational influence in reducing ambivalence. Based on the known effect of informational influence, and the suspected effect of social pressure, we expect from both that they decrease ambivalence.

> *H1*: Participants high in ambivalence are expected to show a decrease in ambivalence when confronted with social pressure.
>
> *H2*: Participants high in ambivalence are expected to show a decrease in ambivalence when confronted with informational influence.

We further expect that the change seen in those two conditions is substantially different from that in the control condition.

> *H3*: We expect the difference in ambivalence across time points in the social pressure and the informative influence conditions to differ from that of the control condition.

And lastly, as there is little research done on social pressure and ambivalence reduction, there is little to say about how good of a persuasive method social pressure is compared to informational influence. However, research has shown that normative information is more effective than information alone (Cialdini, 2003), indicating that social pressure could be effective. Nevertheless, as social pressure introduces pressuring and interpersonal aspects compared to normative information alone, uncertainty about social pressure's effect remains. Therefore, we posit Hypothesis 4:

> *H4*: As relative effects are unknown; we expect the ambivalence change means in the social pressure and information to be similar.

Method

Participants

Recruitment

Participants were sampled from two different pools, a snowball sample and the RUG's internal first-year participant pool (SONA). The snowball participants were recruited through Instagram Story Posts, Facebook Posts, and personal messages, shared by friends and family to also reach further outside of the researcher's personal circle. Snowball participants received no reward. Participants from SONA were rewarded with course credits. See Appendix B for recruitment texts.

Data Cleaning

Of the initially 135 participants (SONA $n = 28$, Snowball $n = 107$), twelve had to be removed for not consenting, and 27 were removed as they had too few mixed feelings about

flying as a means of transportation. Further, $n = 20$ participants were removed for not finishing the experiment. After the initial launch of the study, a mistake was found in the programming of the Qualtrics study that assigned the second subjective ambivalence measure as a condition, displaying it only to some. This mistake was corrected as soon as it transpired. Due to this, the first 13 responses were deleted.

Sample

The final sample was made up of 76 participants, recruited through the SONA-pool ($n = 21$) and snowball sampling on social media ($n = 55$). It consisted of 63.2 % female participants ($n = 87$) and 32.9% ($n = 25$) male, two people who identify as non-binary/third gender, and one person who preferred not to say. The majority of the sample was between 22 and 25 years old ($n = 38$) and 18-21 years ($n = 20$). Eighteen participants were 26 or older. In general, the snowball sample was older than the SONA sample, with 71.4% of the SONA participants indicating that they were between 18 and 21 years old. In the snowball sample, 60% of participants indicated that they were between 22 and 25 years old. The sample was relatively left-leaning ($M = 3.83$, $SD = 1.19$, range: 2 – 8). Further, 56.6% of participants indicated being vegetarian or vegan, 30.3% reported not being either, and 13.1% indicated not yet being vegetarian or vegan. Notably, when asked how they identify, participants indicated their identification at $M = 79.2$ % ($SD = 32.3$) as students, and $M = 61.2$ ($SD = 24$) as environmentalist[1]

Design

The study was set up as a 1 (high ambivalence) x 3 (persuasive method: social pressure vs. informational influence vs. control) experimental between-participants design, measuring ambivalence reduction. The study was conducted on the online research website Qualtrics. Ambivalent attitude holders were identified through an initial item asking them whether they have mixed feelings about flying as a means of transportation. As our target

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[1] Further Identification Measures can be found in Appendix C.

group was ambivalent individuals only, this item served as a cut-off item. Those that indicated having no or little mixed feelings were excluded from the study. In what followed, participants were asked to fill in the subjective ambivalence measure, exploratory questions used as fillers, and the objective ambivalence measure. Participants were randomly assigned to the social pressure, informational influence, or the control group, in which they were exposed to the manipulation. After, participants were asked once more to rate objective ambivalence and subjective ambivalence and answer exploratory questions, as well as the attention and manipulation checks.

Manipulation and Measures[2]

Manipulation

Participants were randomly placed into either the social pressure, informational, or control condition. We manipulated social pressure and informational influence via fake blog articles. We chose this method as it was the most practical solution to solve the problem of how to keep the conditions as similar as possible and avoid confounds concerning the social nature of social pressure. The informational and social pressure manipulations originated from the same, identical text, written by the study author based on several sources. The informational text, however, focused and included informational cues, such as "*Even a return flight from London to Berlin emits around 0.6 tonnes CO2 – three times the emissions saved from a year of recycling*". The social pressure text left out these informational cues and was then adjusted to reflect normative and interpersonal cues, like "*More and more people are deciding to reduce their airplane travel*" or "*We need to work on this together*". The text for the control condition was taken from a webpage (Claim Compass, July 2020) titled "*The Biggest and Busiest Airports in Europe in 2020*" (see Appendix A for the manipulation materials and sources). The text was informational, but it did not talk about environmental

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[2] All Materials and Measures can be found in Appendix A - Manipulations and C - Measures.

concerns. Before and after reading the manipulation, all participants were exposed to the same materials, as introduced below.

Manipulation and Attention Check

We used manipulation checks to assess whether participants caught the intended tone of the manipulation. In two open questions, we asked participants first how they perceived the tone of the text and how they felt while reading the text. Further, on 1-100 slider scales, participants were asked to what extent they felt like they "had to answer in a certain way", or like they were "uncompromised in how they [you] answered". On two separate 1-100 sliders, they indicated whether they perceived the text as "informative" and as "pressuring".

Attention Check. An attention check was placed between two filler questions answered on a 5-point Likert Scale ("*To make sure you are paying attention; we ask you to choose 'Rarely*'").

Measures

Subjective Ambivalence. Subjective Ambivalence (SA) was assessed via a six-item 7-point Likert scale adapted from Ton and colleagues (in press). The items asked about their agreement with statements concerning their feelings towards flying (e.g., "*I feel conflicted about flying as a means of transportation.*" Or "*I am sure about flying as a means of transportation.*"). Answer possibilities ranged from 1= *not at all* to 7= *a lot.* Two items were removed from the original scale as they did not reflect the feelings that could apply to flying. SA was assessed once before and once after the manipulation, with the two scores being used as time one and time two for the MANOVA. A negative difference between the means of the two means will be interpreted as SA reduction. The scale showed good reliability with α = .86.

Objective Ambivalence. Objective Ambivalence (OA) was measured with the Objective Ambivalence Scale, adapted from Thompson and colleagues (1995). Participants were asked to rate how positive or negative they felt about flying, respectively (e.g.,

"Considering only the POSITIVE aspects of flying, and ignoring all negative aspects of it, how POSITIVE are your thoughts and feelings on flying as a means of transportation?"). The original 11-point Likert scale was reduced to a 7-point Likert scale (1= *no positive thoughts,* 7 = *maximum positive thoughts*). OA was measured twice, once before the manipulation, and once directly after. The positive and negative values of each participant are used to create an index of OA using the formula: (POS+NEG)/2 - |POS – NEG| (Thompson et al., 1995). The higher the final index score, the more objectively ambivalent the participant, with scores able to range from -2 to 7. In our sample, scores ranged from -1 to 5. A negative difference between the means of these final index scores will be interpreted as OA reduction.

Exploratory Questions. The participants were asked to answer extra questions, which served to make the participants make sense of the study ('filler questions') for them while also offering us exploratory data. The exploratory questions referred to participants' behaviors and cognitions about climate change and flying. A complete list of the exploratory questions and the respective descriptive statistics can be found in Appendix C.

Analysis Plan and Power Analysis

As a first step, data were to be cleaned from incomplete cases (i.e., non-consenting, not ambivalent enough, and discontinued responses). As part of the preliminary analysis, we planned on performing one-way analyses of variance (ANOVA) to assess whether the manipulation checks did detect any differences in the conditions. This will serve as an indicator of how well the manipulation texts worked.

For the main analysis, data were to be analyzed through paired samples t-tests for H1 and H2 (for both OA and SA). Given that the data checks for all assumptions, a one-way repeated measures multivariate analysis of variance (MANOVA) for H3 was to be conducted. These assumptions are independence of cases, random sampling, multivariate normality, and homogeneity of covariance matrices. If the MANOVA were to be significant after running it,

H3 and H4 we planned to test further by first computing mean ambivalence change variables (Time 2 - Time 1, for both SA and OA). Through these, if put in a one-way ANOVA, we could detect possible significant differences (and similarities) through multiple comparisons as a part of post-hoc testing.

However, if the assumptions are not met, adequate tests or corrections were to be chosen to adjust for potential deviations from normal distributions or homoscedasticity. However, if the MANOVA were to be insignificant, then no further analyses of the main variables were to be performed.

Power Analysis. A power analysis for the global effects of the MANOVA was conducted using G*Power (Faul et al., 2007), with an assumed small effect size of $f^2 = .0625$ (Cohen, 1998), an $\alpha = .05$, and a power of 0.8, which indicated that the full sample would need to consist of 99 participants. As we did not reach 99 participants but $n = 76$, we performed a sensitivity analysis with G*Power (Faul et al., 2007). Looking for a power of 0.8, we found that the effect would have to be $f^2 = .0833$ in order to be found at all. Thus, we would have to find an effect of the latter size if there were any effects to be found at all. Therefore, the following results should be interpreted with caution, as the study is underpowered.

Results

We aimed to find out how social pressure fares against informational influence in reducing ambivalence. Specifically, hypotheses 1 and 2 posited that both social pressure and informational influence have an ambivalence-reducing effect. For hypotheses 3 and 4, social pressure and informational influence were compared to one another as well as the control condition.

Manipulation Checks

To first check whether the manipulation worked, we conducted a one-way ANOVA. For this, we related the different conditions with the items assessing the perception of

pressure, informativity, feeling uncompromised, or whether participants felt like they had to answer in a certain way. The social pressure condition was perceived as significantly more pressuring than both the information and the control condition (F (2, 73) = 12, p < .001). No such difference was found for our manipulation check assessing how informative the text was perceived to be (F (2, 73) = 0.008, p = .992), or how uncompromised the participants felt in answering (F (2, 73) = .130, p = .879). However, results indicate that participants in the social pressure condition felt more like they had to answer in a certain way (F (2, 73) = 4, p = .022).

Table 1.

Descriptive Statistics Manipulation Checks

	Condition	Mean	Std. Deviation	N
To what extent did you feel that you had to answer in a certain way?	Social Pressure	39.88	30.39	25
	Informational	21.60	21.17	25
	Control	21.23	27.79	26
	Total	27.49	27.80	76
To what extent did you feel uncompromised in how you answered?	Social Pressure	50.84	29.91	25
	Informational	49.80	32.55	25
	Control	49.81	35.70	26
	Total	50.14	32.41	76
To what extent did you experience the text as informative?	Social Pressure	48.60	29.03	25
	Informational	64.20	23.73	25
	Control	61.19	28.03	26
	Total	58.04	27.52	76
To what extent did you experience the text as pressuring?	Social Pressure	63.76	29.01	25
	Informational	33.88	28.91	25
	Control	24.42	26.90	26
	Total	40.47	32.60	76

Note. The means in this table stem from a slider scale labeled from 0 – 100.

Main Analysis

Descriptive Statistics

In the final cleaned sample, participants were spread across conditions in relatively equal groups. Descriptive statistics for the mean index scores of OA at times 1 and 2, the

mean scores for SA at times 1 (SA1_M) and 2 (SA_2M), and the mean reduction scores for both OA and SA (OAR; SAR)[3] are displayed in Table 2.

Table 2

Descriptive Statistics

Condition		N	M	SD	Min	Max
Social Pressure	OA1	25	2.46	0.90	0.50	4.00
	OA2	25	2.14	1.05	0.50	4.00
	OAR	25	-0.32	0.89	-1.50	1.50
	SA1_M	25	4.43	1.34	1.83	6.83
	SA2_M	25	4.36	0.99	2.17	5.67
	SAR	25	-0.07	0.98	-2.33	2.33
Informational	OA1	25	2.56	1.36	-1.00	5.00
	OA2	25	2.52	1.47	-1.00	5.00
	OAR	25	-0.04	0.89	-2.00	2.00
	SA1_M	25	4.58	1.24	2.33	7.00
	SA2_M	25	4.90	1.33	2.00	7.00
	SAR	25	0.32	0.92	-1.67	2.50
Control	OA1	26	3.00	1.26	0.00	5.00
	OA2	26	2.81	1.26	0.50	5.00
	OAR	26	-0.19	0.91	-3.00	1.50
	SA1_M	26	4.51	1.25	1.00	6.50
	SA2_M	26	4.69	1.25	1.00	6.33
	SAR	26	0.18	0.48	-.83	1.17

Note. The scores for OA1 and OA2 are calculated index scores, as described in the Methods. The scores for SA1_M and SA2_M are the means of subjective ambivalence that have been measured along a six-item 7-point Likert Scale.

Paired Samples T-Tests

To test hypotheses 1 and 2, we used paired samples t-test. Here, we see that contrary to what we expected in Hypothesis 1, social pressure did not reduce SA ($t(24) = -0.34$, $p = .37$, $d = -.07$), but significantly reduced OA ($t(24) = -1.8$, $p = .042$, $d = -.36$). Interestingly, within the informational influence condition, we can see that SA did *increase* from time 1 to time 2 ($t(24) = 1.75$, $p = .047$, $d = .35$), whereas there was no difference for OA ($t(24) = -0.22$, $p = .41$, $d = -.04$). While not a hypothesis, it is interesting to note that for the control condition, too, we found a statistically significant difference for *increasing* SA ($t(25) = 1.89$,

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[3] Calculated as SA2-SA1 and OA2-OA1, respectively.

p = .035, *d* = .37), while no such difference is present for OA (*t (25)* = -1.08, *p* = .14, *d* = -.21). Plots for both SA and OA are portrayed in Figures 1a and 1b.

The results show mixed results for Hypotheses 1, with social pressure producing a statistically significant effect for reducing OA (*p* = .042) but showing no such difference when it came to reducing SA. Hypothesis 1 is thus not confirmed, but the results show that social pressure did indeed decrease OA. For Hypothesis 2, we see that OA showed no significant change in the informational influence condition, whereas SA even increased. Interestingly, the results indicate that the control condition, too, saw an increase in subjective ambivalence (*p* = .035).

Figure 1a

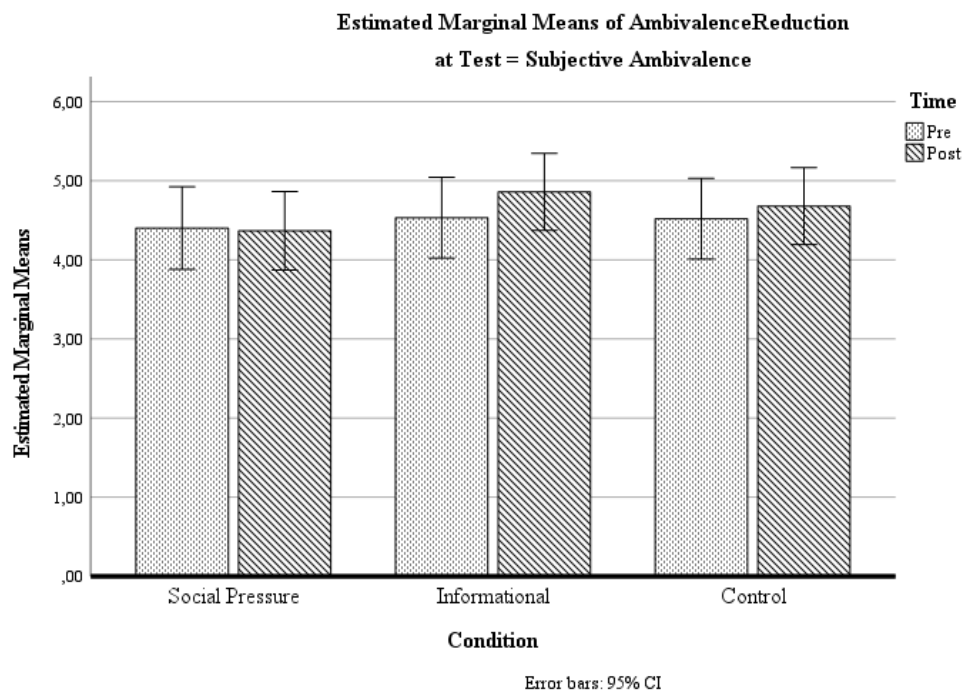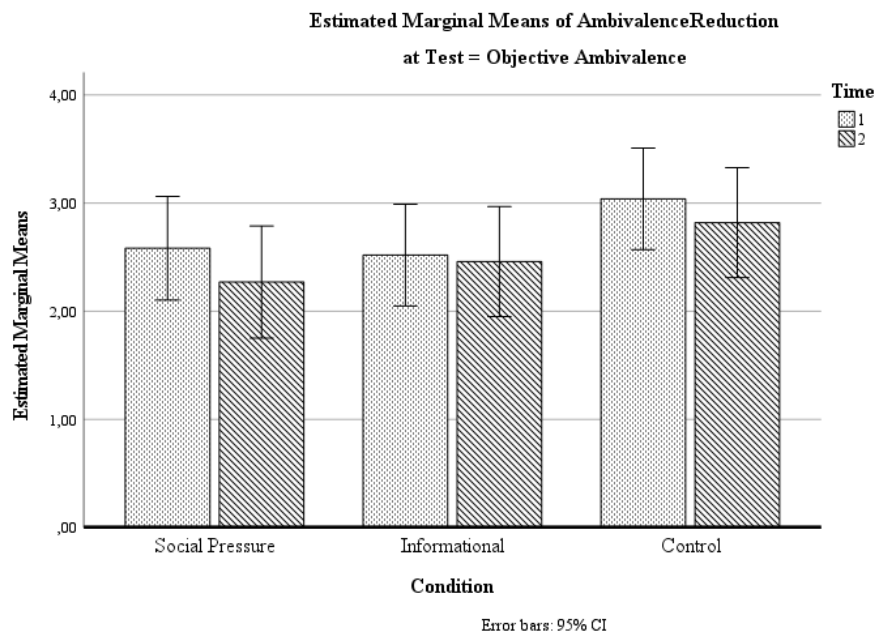*Bar Graph Marginal Means per Condition for Subjective Ambivalence*

Figure 1b

Bar Graph Marginal Means per Condition for Objective Ambivalence

Error bars: 95% CI

Repeated Measures MANOVA

In Hypothesis 3 we suggested a difference in ambivalence reduction between Social Pressure and Informational Influence on one hand, and the Control condition on the other. This, we tested with a one-way repeated measures MANOVA, also called doubly MANOVA. Box's test of equivalence of covariance matrices was significant (Box's M = 36.31, p = .30), indicating unequal spread. However, this test is very sensitive to underpowered studies, which the one at hand is. With the repeated measures MANOVA, we can see whether there are significant correlations between our dependent variables, next to seeing whether there is a difference in them across time points. The doubly MANOVA was performed on SA and OA over two points in time. The manipulation condition was the between-subject factor: (1) social pressure condition, (2) informational influence condition, and (3) control condition. The within-subjects factor was the measurement over time, (1) pre-manipulation, (2) post-manipulation. For both SA and OA, the different conditions did yield no statistically significant difference over time (F (2,73) = .074, p = .99, partial η^2 = .002). Further, there is

no statistically significant difference between the conditions ($F (2,73) = 1.67$, $p = .19$, partial $\eta^2 = .044$).

Thus, Hypothesis 3 could not be confirmed, as there was little to no difference in overall ambivalence reduction across the different conditions. That is, even though there are statistically significant differences among the conditions, the general results do not differ so much per condition, and across all measures. This also partly applies to the results for Hypothesis 4, which focuses on social pressure and informational influence. While the two conditions exerted their effects on different measures, and in different directions, overall, they do not differ to a great extent.

As there were no significant differences between the conditions, we could not perform or interpret any post-hoc tests.

Exploratory Analysis

We wanted to see whether participants that can choose not to fly differed from those participants that do not have the option. For this, we split the data along the item that assessed the option of not flying (Can Fly: $n = 50$, Must Fly: $n = 26$). Notably, the participants who could not choose were more ambivalent to begin with than those that could choose. We performed a paired samples t-test to gather an impression of how the option of not flying influenced ambivalence reduction across conditions (see Table 3). Participants who indicated having no other feasible way of traveling to their family or friends than flying did show significantly more objective ambivalence reduction than those that have other options. Interestingly, subjective ambivalence did also increase for this split.

Table 3.

Paired Samples Test

If you live away from your family and/or friends, is there a way to visit them that is feasible (i.e., affordable, efficient, ...) without flying?			Paired Differences						Significance
				Std. Deviation	95% Confidence Interval of the Difference				
			Mean		Lower	Upper	t	df	One-Sided p
Yes	Pair 1	OA2 - OA1	-0.10	0.95	-.37	.17	-0.75	49	.23
	Pair 2	SA2_M - SA1_M	0.11	0.87	-.14	.35	0.86	49	.20
No	Pair 1	OA2 - OA1	-0.35	0.76	-.65	-.04	-2.33	25	.01
	Pair 2	SA2_M - SA1_M	0.22	0.73	-.08	.51	1.52	25	.07

We further asked participants about how they distributed responsibility to mitigate climate change across actors (slider scale, 1 – 100 (not cumulative), with options *Governments, Corporations, Individuals, Social Movements, Other*). Here, on average, participants attributed governments with a mean responsibility of 78%, 73% to corporations, 47 % to individuals, and 44% to social movements. Further information on the exploratory measures can be found in Appendix C.

Discussion

We set out to investigate how social pressure fares against informational influence in reducing ambivalence towards flying. Pursuing this question, we expected social pressure (H1) and informational influence (H2) to reduce ambivalence. We further expected that the social pressure and informational influence condition would differ from the control condition in the mean ambivalence reduction across time points (H3). Lastly, we expected that social pressure and informational influence perform similarly in reducing ambivalence (H4).

We found only partial support for Hypothesis 1 and the usefulness of social pressure, and no support for Hypothesis 2 and its suggested effect of informational influence. Further, Hypothesis 3 could not be confirmed, as there was little to no difference in overall ambivalence reduction across the different conditions. That is, even though there are statistically significant differences within the conditions, the general results do not differ so much between conditions, and across all measures. This also partly applies to the results for Hypothesis 4, which focuses on social pressure and informational influence. While the two

conditions exerted their effects on different measures, and in different directions, overall, they do not differ to a great extent. To that extent, social pressure and informational influence did not perform similarly but are also not that different in the current study. Thus, there is mixed evidence for the usefulness of social pressure and informational influence in reducing ambivalence. Yet, as the study was underpowered, the results and their implications have to be interpreted with a grain of salt.

Social Pressure and Informational Influence

Prior research indicates that ambivalent attitude holders are more open to persuasion than non-ambivalent people (Hodson et al., 2001). However, it also mentions that highly ambivalent people are motivated to reduce their ambivalence (van Harreveld et al., 2004). What we would have expected, then, is an overall decrease in ambivalence for both SA and OA. While we saw no such effect of social pressure on SA, OA was significantly reduced by SP. On the other hand, the well-tried method of informational influence did show a surprising *increase* in SA and no difference for OA. Similarly, the control condition showed an increase in SA and no difference for OA, as well. All significant effect sizes ranged from small to medium, and, again, are to be interpreted with the limitation of small statistical power in mind. The discussion can thus only be limited, as with higher power, the results might change, and would be more accurate.

Informational Influence and the Control Condition

Seeing that SA did increase for the informational influence (and control) condition, it tells that participants' mixed feelings towards flying increased across the two time points. This effect might have been because participants were encouraged to think about the topic of flying and climate change. Simply getting in touch with the message and engaging with the topic could have momentarily increased their mixed feelings, as they were made aware of the consequences of flying. Receiving messages about the negative impacts of flying (informational condition), or the sheer numbers of passengers (control condition) could have

increased engagement with the topic, and therefore increased subjective ambivalence. Further, several participants indicated in the open answer manipulation checks that they felt guilty about flying in reaction to the text. It is possible that participants simply felt worse after reading the texts. However, participants' evaluation of the positive and negative aspects stayed the same. To explain why there was no reduction in OA, the persuasiveness of the message can be called into question. Within the informational text, participants were exposed to univalent, negative arguments, rather than to a more balanced exposition of facts. Our participants might have not been satisfied with this one-sided portrayal, as highly ambivalent individuals are motivated to thoroughly process information (van Harreveld et al., 2004) and consider a large number of arguments (Jonas et al., 1997). This is in line with one study that showed that feeling ambivalent only led to effortful information processing when participants believed that the offered information could reduce their ambivalent feelings (i.e., subjective ambivalence) (Clark et al., 2008).

Social Pressure

The content of the manipulation text of the social pressure condition was univalent, too. However, the results indicate a decrease in OA. We argued that the social pressure condition could reduce ambivalence because of its normative and interpersonal content, which is useful when it comes to persuasion (Cialdini, 2003; Hodson et al., 2001). A reduction only of OA, and not SA, could indicate that reducing ambivalence with social pressure is a reduction at a superficial level. While participants are shown to have more univalent evaluations of flying, their feelings about flying remained the same. What is difficult to explain is why their feelings of SA were stable over the two measures, whereas for both the informational influence and the control condition it increased. Yet this difference

may stem from inaccuracies due to the lack of power, especially seeing how the effect sizes for all significant effects are small to medium.

The answers to the open questions belonging to the manipulation checks were insightful, too. In both the social pressure and the informational influence conditions, participants described their experience of the respective texts as pressuring, some participants wrote that they felt attacked and guilty. The content of the texts elicited similar feelings, and the content was kept the same except for the appeals. We can thus possibly assume that the adjustments in appeals (i.e., informative vs. normative and interpersonal) could have made the difference in ambivalence reduction versus increase. This is in line with our expectation that normative appeals are the most useful aspect of social pressure in reducing ambivalence. Future research could thus benefit from an approach that deconstructs and shines a light on the processes behind the appeals, for instance by assessing participants' perception of the degree of outside influence in their thought processes.

Exploratory Analysis

Interesting findings emerged when the file was split along whether participants could choose (not) to fly to their family and friends. And indeed, it showed that the effects were more pronounced for those that had to use airplanes as a mode of transportation. Objective ambivalence was reduced significantly, and subjective ambivalence was increased. In other words, the participants that had no other means but to fly were even more influenced by the manipulations than their counterparts who have other possibilities. It is not surprising that the participants who cannot choose not to fly felt more subjectively ambivalent, as they had just been confronted with facts about a behavior they apparently cannot change. On the other hand, the decrease in objective ambivalence is somewhat of a surprise. In admitting to the environmental dangers of flying, yet not being able to stop flying, they invite cognitive dissonance (Festinger, 1957). Cognitive dissonance is the state elicited when one's actions do not align with one's attitudes. Discomfort and consequences on our self-concept may follow.

Seeing how it were also the participants in the social pressure condition that showed the biggest decrease in objective ambivalence, it seems interesting to investigate how likely people are to reduce their ambivalence despite or because of their (adverse) circumstances.

Implications

Albeit delivering mixed results in the current study, an improved conceptualization of social pressure seems promising in reducing ambivalence (see e.g., Gerber et al., 2008; Hohman et al., 2016). This would mean redirecting the focus on normative and interpersonal factors rather than on the pressure aspect. The interest in social pressure within this research came about whilst thinking about how close others' opinions shape our own. How sometimes, we feel pressured into conforming to others' opinions, even though we are ambivalent about a topic. Thus, when thinking about the real-life implementation of persuasion, we see a divide: The operationalization of social pressure within this study, and how we experience social pressure in everyday life. As the fake blog article manipulation was only somewhat successful in reducing ambivalence, it is of interest to increase ecological validity. For this, a setting closer to the real-life experience of social pressure should be chosen. This applies not just to future research, but also when thinking about how social pressure can be implemented in persuasive communication. Namely, especially the interpersonal aspect can be heightened by addressing the behavior and cognitions of a community that a person belongs to (see also Mertens & Schulz, 2021 on referent groups). Highlighting group memberships such as being an environmentalist, or a traveler, as we assessed in our study, could potentially change the way that participants react to the persuasive messages they receive (see Ma & Hmielowski, 2021).

When thinking about the ecological validity of the study, we have to consider that we considered flying from a unifocal perspective, the environmental one. However, in addressing climate-related aspects of flying only, we neglect that participants also hold other thoughts about flying that weigh in their evaluation of the topic. For instance, for one-third of

the participants, it was not an option to avoid flying altogether. As indicated by our filler question, 26 participants out of 76 indicated that there was no other feasible way of visiting their friends and family. This goes hand in hand with what we see reflected in real life: the high financial cost of taking the train or the car, the long distances between your place of residence and the places where friends and family live, time restrictions based on little vacation days, and limited infrastructure. This sentiment rings true for many environmental behaviors - there are structural factors that make pro-environmental behavior difficult, inaccessible, and especially: unattractive when compared to less environmentally-friendly behaviors (see e.g., Gifford & Nilsson, 2014). To quote one of our participants: "I wish Australia had more alternative options to flights such as railways for rural areas. If this was the case I would be way more inclined to choose this option over flying to help lower my environmental footprint." To quote another participant: "I feel guilty for not doing more, however I am so pessimistic that I do not see a huge advantage of altering my whole behavior. I do some things like avoiding flying or eating less meat than I'd usually do, but being vegan while seeing the world collapse does not seem fruitful to me."

These quotes go hand in hand with what we also saw in terms of the distribution of responsibility to mitigate climate change. On average, participants assigned 78.8% of the responsibility to governments (as opposed to 47.1% on average to individuals). Enabling environmentally-friendly behaviors is a responsibility of governments in mitigating climate change. While many participants indicated that they are taking individual measures, this distribution of responsibility indicates that our participants are looking to the government to do more when it comes to mitigating climate change. To quote once more: "It feels insignificant because it should not be the responsibility of the individual but that of the system/government".

Limitations and Future Research

The current study has shown that the used approach to manipulate social pressure has the potential to reduce ambivalence. Not only did we see a reduction in objective ambivalence, but we also saw that the manipulation checks indicated that participants felt pressure in the social pressure condition. Nevertheless, the approach could be improved, as a manipulation closer to real life could improve insights into how social pressure works. Future research could benefit from trying on a social pressure approach that makes use of the social networks of participants (see Mallinson & Hatemi, 2018). Confederates could be used to manipulate the perception of actual social pressure, rather than exposing participants to the highly artificial interpersonal cues used in the current study. However, this would be difficult to compare to informational influence, and is thus not an option for studies comparing the two.

One of the main limitations of this study is its small sample size, and thus its small power. While we set out for a sample of $N = 99$, we ultimately reached a sample size of $N = 76$. The results have thus to be interpreted with caution, as true effects might not be detected within underpowered studies. Further, chances increase that the found effects could be inflated, meaning that they are higher than they would be in reality.

Another caveat is that it was not visible how the reduction in objective ambivalence manifested – whether participants felt more indifferent, or in what direction their ambivalence reduction went. Future research could thus benefit from asking for a more insightful elaboration of participants' ambivalence, both subjective and objective.

Further, the sample was somewhat biased, as it was quite left-leaning. The sample did not include many who identified themselves as right-leaning. Seeing how climate change, and especially our behavior and attitudes towards it, are a political issue (Abbas, 2012), it would be helpful to have a broader distribution of political orientation (Duarte et al., 2014). Investigating how right-leaning people, often opposed to labeling climate change as a

paramount issue of our time, react to information on flying as a topic within climate change might be very instructive. For instance, within one study, it was found that more conservative individuals tend to conform more to pressures and cues from their social surroundings (Mallinson & Hatemi, 2018). Future studies should thus include more politically spread-out participants and could recruit those in places where they could be expected (e.g., churches, lectures, etc.).

One of the major improvements to the study could come from addressing the measures and their timing. For one, the objective ambivalence measure elicited confusion in some participants. In verbal communication, participants said that they had difficulties switching from thinking only about the positive to only the negative. Some even said that if they completely disregarded the negative, then they must feel completely positive, and vice versa. Not only could this have skewed the results and potentially explain the lack of reduction in objective ambivalence. It hints at a shortcoming of ambivalence research in general. A better approach to measuring objective ambivalence could be to list a number of positive or negative statements next to one another, have them rated on a Likert scale, and calculate the objective ambivalence based on this (see e.g., Russell et al., 2011).

On the other hand, the little time between measurements could have further confused participants. Seeing that the experiment lasted around ten minutes for most participants, this might simply not be enough time to be truly influenced by what you just have read. Further, as there was so little time between the measurements, participants might have felt confused at the reappearance of the measurements in such a short time. In fact, in correspondence with some of the participants, it was mentioned that they thought a mistake had happened, and thus tried to answer in the same way as they had before. These mistaken demand characteristics might have influenced the study outcome. To improve this situation, future research could either give more time to participants, by creating longitudinal designs. Or, going after the example by Nordgren and colleagues (2006), participants could be primed by

elaboration on either positive or negative aspects of environmental attitude objects. This could help with allowing participants to deal with the conflicting emotions they experience while thinking about the attitude object (see also Brömer, 2002).

Moreover, we solely looked at ambivalence reduction in this study, mostly because the combination of social pressure and ambivalence is so novel that it required a tentative exploration of the topic. Now that we can say more about the manipulation of social pressure, a future investigation may also benefit from incorporating ambivalent individuals to make behavioral choices. As shown in one study, making a decision helped in reducing participants' felt (i.e., subjective) ambivalence (de Liver et al., 2007). Participants could be made to indicate whether they would think about transportation alternatives next time they opted to fly. Or, more radical, whether they would be willing to vow not to fly for a year.

Conclusion

The current study aimed at investigating social pressure as a potential pathway to persuade individuals into reducing their ambivalence toward flying as a means of transportation.

We could however find only little evidence for social pressure as a method to *reduce* people's ambivalence and were surprised to find that informational influence did only help in *increasing* participants' subjective ambivalence. As I have argued in the above discussion, informational influence is usually a useful method to change attitudes and reduce ambivalence. The takeaway from this study should be that social pressure can be useful in reducing ambivalence, but that it should be more thoroughly investigated. Similarly, the surprising effect of informational influence shows that the study methodology can and should be improved.

Continuing research on how ambivalence can be reduced through socio-normative appeals is a promising approach, and the discussion brings up important insights into how such methodology could be designed. In looking ahead at how to use normative and

interpersonal approaches to reduce ambivalence, natural encounters should be studied better

and be imitated for a more fruitful approach on how to use them in persuasive

communication.

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Appendix A

Manipulation Text Social Pressure

Why You Need to Curb Your Flying, Now

When it comes to the climate, flying is the most damaging way to travel. It may well represent the biggest chunk of your own carbon footprint, which you should aim to reduce, as you probably heard before. Interestingly enough, domestic flights are even bigger climate sins than long haul flights. This is because take-off and landing use the most fuel, with flying at level for a given distance becoming cleaner in the long run. Maybe then it should be those flights that we should avoid. You may have heard about it already in your own close circle, but more and more people are deciding to reduce their airplane travel, or completely cut it out of their itinerary. Many appeal to their conscience not being able to further climate change with this enormous exhaustion of pollutants and emissions. Our individual choices may have, taken together, a bigger impact than we might think. Your choices can shape the future. See it this way: What you do as an individual affects the people around you. Think about the way in which your friends and family have impacted your consumer choices. If people see how well you are doing not flying, they might come to think and reflect about it themselves. And that is why it is so important to ignore the thought of "But isn't the flight taking off anyway, so my not-boarding will not stop it from flying?" Your not-flying might as well have an impact on other people, whose behavior then has an impact on other people and so on. Your decision not to fly has an impact, just as your decision to hop on yet another short-distance flight to spend a weekend in a city that you might as well could reach by train. We need to work on this together.

We ask you to reflect: How important is the next flight you planned, really, especially compared to the pollution it will likely cause? Yes, airplane tickets may be cheaper than taking the train, and that is a motivator for many to choose to fly. But knowing the harm you may cause, can you still face the idea of hopping on that flight? It is necessary to act now. What we call for is that you show responsibility, that you reduce your short-distance flights immediately, and that you realize the impact your own behavior has on the environment. We can no longer stand by as we harm the planet, and it is necessary to get involved, to work together on this issue.

Do you want to be the person that is accountable for more harm done to the environment than necessary? Take the train. Go by bus. Cutting down on short-distance flights is one of the best solutions for you to make your voice for the environment heard in the transportation sector. And most importantly: Inform yourself, talk to your friends, go protest. Let us all do each other a favor and avoid harmful behaviors towards the environment.

Manipulation Text Informational Influence[4]

Reasons To Reduce Your Flying

You may have read the comparisons before: "Someone flying from Lisbon to New York and back generates roughly the same level of emissions as the average person in the EU does by heating their home for a whole year." Or: "Even a return flight from London to Berlin emits around 0.6 tonnes CO_2 – three times the emissions saved from a year of recycling." When it comes to the climate, flying is the most damaging way to travel. But seeing that only about 20% of the world's population have taken a flight, and only a small percentage of that being frequent fliers, its overall contribution to about 2.5% of global CO_2 emissions seems excessive.

Interestingly enough, domestic flights are even bigger climate sins than long haul flights. This is because take-off and landing use the most fuel, with flying at level for a given distance becoming cleaner in the long run. What is it that you can do about this? More and more people are deciding to reduce their airplane travel, or completely cut it out of their itinerary. One common objection to this is that we as individuals do not contribute to climate change in the way that multinational corporations do. But we are consumers, and therefore, our individual choices may have, taken together, a bigger impact than we might think.

See it this way, too: What you do as an individual affects the people around you. If people see how well you are doing not flying, they might come to think and reflect about it themselves. And that is why it is so important to ignore the thought of "But isn't the flight taking off anyway, so my not-boarding will not stop it from flying?" Your not-flying might as well have an impact on other people, whose behavior then has an impact on other people and so on. Your decision not to fly has an impact, just as your decision to hop on yet another short-distance flight to spend a weekend in a city that you might as well could have reached by train.

This is about responsibility towards the generations that come after us, responsibility towards the nature around us, the animals and all other creatures that populate the ecosystems of this world. It may be time to reflect: Yes, airplane tickets may be cheaper than taking the train, and that is a motivator for many to choose to fly. But knowing the harm it may cause, is it really worth it?

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[4] Sources informing this text were: https://ec.europa.eu/clima/eu-action/transport-emissions/reducing-emissions-aviation_en and https://www.bbc.com/future/article/20200218-climate-change-how-to-cut-your-carbon-emissions-when-flying

Manipulation Text Control [5]

The 5 Busiest European Airports

It's not over yet but anyone who hasn't been living in a cave during the first half of 2020 knows that this year will go down in history as one of the worst for the travel industry. The biggest and busiest airports in Europe have been affected by the corona virus outbreak just as badly as airlines. In Europe, the number of airborne flights in April 2020 decreased by an astounding 93% compared to the same time last year. With the arrival of summer and the need to support the tourism industry which many countries are relying upon for economic survival, things have progressively got better, but we're still nowhere near the air traffic levels of 2019, with 78% fewer airborne planes in June compared to the same period last year.

1. London Heathrow Airport (LHR) (80,886,589 passengers)
Not only is London Heathrow Europe's busiest airport, it keeps welcoming an increasing number of passengers. In 2019, passenger traffic at Heathrow airport grew by +1% compared to 2018. While the epidemic outbreak of 2020 is sure to put an end to this increase, the largest airport in the UK also holds the title of second busiest airport by international passenger traffic.

2. Paris Charles de Gaulle Airport (CDG) (76,150,007 passengers)
The second busiest airport in Europe, Paris' Charles de Gaulle Airport is also France's largest international airport, preceding Paris Orly. With a recorded growth of +5.4% in passenger numbers compared to 2018, Roissy Airport is also one of the fastest-growing one in Europe and the 10th busiest worldwide. In May 2020, Charle de Gaulle Airport implemented measures by European Union Aviation Safety Agency (EASA) and European Center for Disease Prevention and Control (ECDC) aiming at ensuring the health safety of passengers during the COVID-19 pandemic.

3. Amsterdam Airport Schiphol (AMS) (71,707,144 passengers)
With a passenger traffic increase of +0.9% compared to 2018, the largest airport in the Netherlands is the third busiest airport in Europe. Unlike most large airports across the world, Schiphol Airport only has one (massive) terminal building, split in three halls. Despite remaining continuously open during the coronavirus outbreak, the busiest European airport in terms of aircraft movements recorded a severe drop in air traffic since March 2020.

4. Frankfurt am Main Airport (FRA) (70,556,072 passengers)
Fifteenth busiest airport in the world after Schiphol Airport, Germany's biggest airport in passenger traffic is also Europe's fourth busiest airport. Lufthansa's main hub, Frankfurt Airport hosted 1.5% more passengers in 2019 than in 2018. It's also a major hub for international travel, being one of the airports with the most direct routes in the world. A test center was opened in Frankfurt Airport at the end of June 2020 in the hope of reopening air travel and "support a return to a new normal" and help travelers avoid quarantine at their destination.

5. Adolfo Suárez Madrid–Barajas Airport (MAD) (61,734,037 passengers)
Spain's Barajas Airport is the second largest in Europe after Paris-Charles de Gaulle Airport. It is the country's busiest airport, ranking fifth in terms of passenger traffic in Europe. Already a major air traffic centre in southwestern Europe, Madrid's main airport saw a +6.6% increase in passenger numbers in 2019 compared to 2018. After undergoing a complete lockdown in April 2020, Barajas Airport has been progressively reopening, operating on a very restricted air traffic schedule.

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[5] Found and abbreviated from Busson, T. (2020, July 8). The Biggest and Busiest Airports in Europe in 2020. Claim Compass. https://www.claimcompass.eu/blog/biggest-busiest-airports-europe/

Appendix B

Recruitment Texts

SONA participants

Attitudes on Flying

Abstract: Take part in this study that asks about your attitudes and feelings towards flying and climate change.

Description: We seek participants that have mixed feelings or doubts about flying. Within the study, we ask you to read an article on flying as a means of transportation, especially in light of climate change and answer some questions about your attitudes and feelings towards the topic.

Social Media Snowball

Attitudes on Flying

We invite you to participate in this study if you have mixed feelings or doubts about flying. We will ask you to read a text about flying and tell us about your attitudes and feelings about flying as a means of transportation, especially in the light of climate change.

Participants should be older than 18 and speak English at an adequate level.

Appendix C

Appendix C shows the full questionnaire for the snowball sample, including descriptive

statistics for the variables not displayed in the results section. The SONA sample survey only

differed in that they were asked to insert their SONA-ID and were not offered a

pseudonymized random code. The information texts were altered to reflect this difference.

INFORMATION ABOUT THE RESEARCH
Version for participants

"Attitudes on Flying"

You are invited to participate in our study on attitudes toward flying as a means of transportation. You are invited to participate in this research because you are over 18 years old, understand English adequately, and have mixed feelings about flying in the face of climate change.

The present research is conducted by Gonneke Marina Ton (g.m.ton@rug.nl) and Lea Smidt (l.smidt.1@student.rug.nl) as part of a Master's Thesis project. The project is further supervised by Prof. Dr. Katherine Stroebe (k.stroebe@rug.nl) and Prof. Dr. Martijn van Zomeren (m.van.zomeren@rug.nl). Participation in the research is voluntary. However, your consent is needed. Therefore, please read this information carefully. Ask all the questions you might have, for example because you do not understand something. Only afterwards you decide if you want to participate. If you decide not to participate, you do not need to explain why, and there will be no negative consequences for you. You have this right at all times, including after you have consented to participate in the research.

The Purpose of the Study

The purpose of our study is to look at attitudes held towards flying as a means of transportation, especially in regard to climate change.

Within this study, you will be asked to tell us about some of your attitudes towards flying and climate change. Further, we will ask you to read a text about flying as a means of transportation, after which we will ask you some more questions about your feelings and attitudes.

There are no direct benefits to be gained from participating in this study. However, it offers a chance for you to reflect on your behavior and may provide insights on the topic. One of the topics discussed in this study is climate change. Being confronted with its negative consequences may cause you some discomfort. However, we do not expect you to experience any other disadvantages by participating in this study.

Data Processing

The data recorded during the course of this study will be used exclusively for the purposes of a Master Thesis. In this research, we collect demographic data (e.g., age, gender, etc.), and other potential personal identifiers (pseudonymized random code). Before the end of data collection (30.06.2022), you have the right to access, rectify, and erase your personal data by contacting the researchers using your pseudonymized random code. In order to protect your privacy, the link between information that can identify you (i.e., your pseudonymized random code) and the data we collected from you will be deleted in the process of preparing the data for analysis. The results of the research may be made public in the form of a Master's Thesis in the RUG online library. In case of further publicization of the research, only anonymized research data will be used, in accordance with GDPR guidelines. The research data will be stored for around 10 years on the university's servers.

In case of publicization of the research, only anonymized research data will be used, in accordance with GDPR guidelines.

What else do you need to know?

You may always ask questions about the research: now, during the research, and after the end of the research. You can do so by emailing one of the researchers involved (l.smidt.1@student.rug.nl or g.m.ton@rug.nl) .

Do you have questions/concerns about your rights as a research participant or about the conduct of the research? You may also contact the Ethics Committee of the Faculty of Behavioural and Social Sciences of the University of Groningen: ec-bss@rug.nl.

Do you have questions or concerns regarding the handling of your personal data? You may also contact the University of Groningen Data Protection Officer: privacy@rug.nl.

As a research participant, you have the right to a copy of this research information.

INFORMED CONSENT
"Attitudes on Flying"
EC code

- I have read the information about the research. I know that in case of questions or concerns, I can contact the researchers (Lea Smidt, l.smidt.1@student.rug.nl or Gonneke Ton, g.m.ton@rug.nl).
- I understand what the research is about, what is being asked of me, which consequences participation can have, how my data will be handled, and what my rights as a participant are.
- I understand that participation in the research is voluntary. I myself choose to participate. I can stop participating at any moment. If I stop, I do not need to explain why. Stopping will have no negative consequences for me.
- Below I indicate what I am consenting to.

Consent to participate in the research:

[ ] Yes, I consent to participate

Consent to processing my personal data:

[ ] Yes, I consent to the processing of my personal data as mentioned in the research information. I know that I can ask to have my data withdrawn and erased. I can also ask for this if I decide to stop participating in the research.

You have the right to a copy of this consent form.

In the last few years, the topic of climate change has become more and more visible in everyday life. There are many things that have an impact on the emission of greenhouse gasses, and therefore on climate change, but in the current study, we want to focus on your attitudes and behaviors towards flying as a means of transportation. What we mean with this is how you yourself use airplanes, and how you feel about your own usage of them, especially in regard to climate change. We invite you to think also think about the difference between short- and long-distance flights, or the reasons why you might fly.

After reading this, can you indicate whether you agree with this statement?

"I have mixed feelings or doubts about flying"

[a lot of mixed feelings, many mixed feelings, some mixed feelings, little mixed feelings, no mixed feelings]

Likert Scale 1-5, cutoff point: *little mixed feelings no mixed feelings*

Those choosing *little mixed feelings* or *no mixed feelings* will be send to end of survey (short debriefing)

Those choosing *some mixed feelings* or higher will be led to the next part

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	some mixed feelings	40	52.6	52.6	52.6
	many mixed feelings	23	30.3	30.3	82.9
	a lot of mixed feelings	13	17.1	17.1	100.0
	Total	76	100.0	100.0	

Now, once more, we ask you to indicate to what extent you agree with these statements.

I have mixed feelings about flying as a means of transportation
I am indecisive about flying as a means of transportation
I feel internally torn about flying as a means of transportation
I am sure about flying/ using flying as a means of transportation (reverse coded)
I feel conflicted about flying as a means of transportation
I have doubts about flying as a means of transportation

7-point Likert scale for all items [not at all fitting – completely fitting]

Now, we want to ask you a few questions about your attitudes and emotions towards climate change and flying as a means of transportation.

In the following, please indicate how much you rate yourself as either of the following.

[Slider Scale, 1-100]

Descriptive Statistics

	Mean	Std. Deviation	N
Student	79.22	32.31	76
Environmentalist	61.20	24.00	76
Traveler	51.41	25.60	76
Extrovert	49.54	25.96	76
Introvert	52.87	23.46	76
Political	53.95	26.29	76

		Student	Environmentalist	Traveler	Extrovert	Introvert	Political
Student	Pearson Correlation	1	.109	.164	.157	-.144	-.105
	Sig. (2-tailed)		.351	.156	.174	.214	.365

Environmentalist	Pearson Correlation	.109	1	.238*	-.024	.121	.255*
	Sig. (2-tailed)	.351		.038	.838	.299	.026
Traveler	Pearson Correlation	.164	.238*	1	.235*	-.129	.132
	Sig. (2-tailed)	.156	.038		.041	.266	.255
Extrovert	Pearson Correlation	.157	-.024	.235*	1	-.857**	.153
	Sig. (2-tailed)	.174	.838	.041		<.001	.186
Introvert	Pearson Correlation	-.144	.121	-.129	-.857**	1	-.059
	Sig. (2-tailed)	.214	.299	.266	<.001		.614
Political	Pearson Correlation	-.105	.255*	.132	.153	-.059	1
	Sig. (2-tailed)	.365	.026	.255	.186	.614	

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

How informed are you of the consequences of climate change?

Answered on a 5-point Likert-scale with three labeled options [not informed at all, somewhat informed, very much informed]

	N	Mean	Std. Deviation
How informed are you on the consequences of climate change?	76	3.92	.86

How do you feel about climate change? This might be a complex question to answer, but we ask you to choose three main feelings.

Feeling	n
Guilty	28
Afraid	19
Optimistic	7
Neutral	5
Apprehensive	4
Ambivalent	7
Concerned	51
Pessimistic	22
Powerless	35
Sad	17
Anxious	22

Indifferent	1	
Dread	8	

Note. Not included are the answers to the open answer option. One participant wrote "ashamed", another wrote "hopeless".

Now, we ask you to fill in a scale reflecting on your positive and negative attitudes towards flying. Keep in mind your own behavior when it comes to traveling via airplanes, and how it may affect the climate. Read the questions carefully and answer without thinking too much about it.

- *Considering only the POSITIVE aspects of flying, and ignoring all negative aspects of it, how POSITIVE are your thoughts and feelings on flying as a means of transportation?*
  [I have: no positive thoughts and feelings, very few, some, mostly, maximum]
- *Considering only the NEGATIVE aspects of flying, and ignoring all negative aspects of it, how NEGATIVE are your thoughts and feelings on flying as a means of transportation?*
  [I have: no negative thoughts and feelings, very few, some, mostly, maximum]

Now, we want to ask you a few questions about your own behavior.

How often do you fly each year? Please indicate the approximate number of times in the box below (single flights, not return). You may refer to the (post-) pandemic years.

	Mean	Std. Deviation	Range
How often do you fly each year?	2.35	2.4	12.00

If you live away from your family and friends, is there a way to visit them that is feasible (i.e., affordable, efficient...) without flying?

[Yes/No/Did not consider this yet]

	N	%
Yes	50	65.8%
No	26	34.2%

Are you vegan or vegetarian?

[Yes/No/Not yet/prefer not to say]

	N	%
Yes	43	56.6%
No	23	30.3%
Not yet	10	13.1%

Is there something you still want to say regarding your own behavior?

[Open Question]

n = 18 gave extensive answers (displayed below), *n* = 10 answered "No", and *n* = 46 gave no input

- I preferably buy clothes second hand
- I behave in a highly pro-environmental way.
- I feel guilty for not doing more, however I am so pessimistic that I do not see a huge advantage of altering my whole behaviour. I do some things like avoiding to fly or eating less meat than I'd usually do, but being vegan while seeing the world collapse does not seem fruitful to me.
- I do eat vegetarian for 2 days per week, try to be mindful of the environment
- I don't agree with every environmental friendly solution I've heard, I feel like I am somewhere in the middle, concerned but not too much
- I feel like I could do better
- Active in environmental awarness raising
- I wish environmentally detrimental options weren't so damn convenient
- I wish AUSTRALIA had more alternative options to flights such as railways for rural areas. If this was the case I would be way more inclined to choose this option over flying to help lower my environmental footprint
- I eat little meat and buy biological foods as much as I can. However, I know I still consume too much. In terms of adapting my house it is very hard to live environmentally friendly because there are limits to some buildings - either constructively or financially.
- I actively engage in raising awareness for sustainability and climate change.
- It can always be better.
- I don't own a car :) (Do have a driver's licence) Also with most things pretty environmentalistic such as short showers, used to do cold but now medium heat. and lower thermostate. I do eat animal products because I believe it has a positive effect on my body and well-being, and I would fly to see as much of the world as I can because I'm in love with all the diversity the world has to offer.
- I try to make conscious choices that I know can contribute to a more sustainable future (thrifting/minimizing single plastic use/choosing greener transportation means)
- It feels insignificant because it shouldnt be the responsablity of the individual but that of the system/government
- I was acting very much in line with being environmentally friendly living (no plastic, feeling offended when others flew short distance, eating no meat for quite some time). I moved and started living in different contexts, which made me feel like my behaviors against climate change have no impact- seems like my thoughts and feelings in that regard don't stem from newsfeed but a lot how my surrounding is behaving).
- I'm trying :)
- I take care of the environment and find it concerning that ministers who are "concerned" about the environment and climate change use private jets to get to their destination. How concerned are they really? As if normal people own a private jet and fly that much as them…

Randomization into either Social Pressure, Informational, or Control Condition. Exposure to respective Manipulation.

In the following, we ask you to rate how you are *feeling* about flying as a means of transportation. Think for example about your own behavior when it comes to traveling via airplanes, and how it may affect the climate. Again, try not to think about it too much, but go with your first thoughts – there are no right and wrong answers.

I have mixed feelings about flying as a means of transportation
I am indecisive about flying as a means of transportation
I feel internally torn about flying as a means of transportation
I am sure about flying/ using flying as a means of transportation (reverse coded)
I feel conflicted about flying as a means of transportation
I have doubts about flying as a means of transportation

7-point Likert scale for all items [not at all fitting – completely fitting]

Now, we ask you to fill in a scale reflecting on your positive and negative attitudes towards flying. Keep in mind your own behavior when it comes to traveling via airplanes, and how it may affect the climate. Read the questions carefully and answer without thinking too much about it.

- *Considering only the POSITIVE aspects of flying, and ignoring all negative aspects of it, how POSITIVE are your thoughts and feelings on flying as a means of transportation?*
  [I have: no positive thoughts and feelings, very few, some, mostly, maximum]
- *Considering only the NEGATIVE aspects of flying, and ignoring all negative aspects of it, how NEGATIVE are your thoughts and feelings on flying as a means of transportation?*

[I have: no negative thoughts and feelings, very few, some, mostly, maximum]

In regard to climate change, how would you distribute the responsibility across actors?

	N	Mean	Std. Deviation
Individuals	76	47.45	26.96
Governments	76	78.29	24.76
Corporations	76	72.79	26.77
Social Movements	75		
		43.99	27.24

n= 25 participants also indicated 'other', and *n* = 12 providing answers:

- The wealthy
- schools
- None
- none

- No
- No
- Family
- companies (economy)
- companies
- Churches
- celebrities
- Aiports

How often do you talk to your family and friends about climate change?; Attention Check: To make sure you are paying attention, we ask you to choose 'Rarely'.;

How often do you talk to your family and friends about flying?

All questions answered on a 5-point Likert-scale [never, rarely, sometimes, often, very often]

Descriptive Statistics

	N	Mean	Std. Deviation
How often do you talk to your family and friends about climate change?	76	3.43	0.93
To make sure you are paying attention, we ask you to choose 'Rarely'.	76	2.03	0.23
How often do you talk to your family and friends about flying?	76	2.96	0.93

To what extent did you

- feel that you had to answer in a certain way?;

- feel uncompromised in how you answered?;

- experience the text as pressuring?;

- experience the text as informative?

[Slider scale 1-100]

Multiple Comparisons
Bonferroni

Dependent Variable	(I) Condition	(J) Condition	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	Upper Bound
To what extent did you feel that	Social Pressure	Informational	18.28	7.57	.05	-.26	36.82
		Control	18.65*	7.49	.05	.29	37.01

	(I)	(J)	Mean Diff.	Std. Error	Sig.	Lower	Upper
you had to answer in a certain way?	Informational	Social Pressure	-18.28	7.57	.05	-36.82	.26
		Control	.37	7.49	1.00	-17.99	18.73
	Control	Social Pressure	-18.65*	7.49	.05	-37.01	-.29
		Informational	-.37	7.49	1.00	-18.73	17.99
To what extent did you feel uncompromised in how you answered?	Social Pressure	Informational	1.04	9.29	1.00	-21.73	23.81
		Control	1.03	9.20	1.00	-21.51	23.58
	Informational	Social Pressure	-1.04	9.29	1.00	-23.81	21.73
		Control	-.01	9.20	1.00	-22.55	22.54
	Control	Social Pressure	-1.03	9.20	1.00	-23.58	21.51
		Informational	.01	9.20	1.00	-22.54	22.55
To what extent did you experience the text as informative?	Social Pressure	Informational	-15.60	7.65	.14	-34.34	3.14
		Control	-12.59	7.57	.30	-31.15	5.97
	Informational	Social Pressure	15.60	7.65	.14	-3.14	34.34
		Control	3.01	7.57	1.00	-15.55	21.57
	Control	Social Pressure	12.59	7.57	.30	-5.97	31.15
		Informational	-3.01	7.57	1.00	-21.57	15.55
To what extent did you experience the text as pressuring?	Social Pressure	Informational	29.88*	8.00	.00	10.29	49.47
		Control	39.34*	7.92	<.001	19.93	58.74
	Informational	Social Pressure	-29.88*	8.00	.00	-49.47	-10.29
		Control	9.46	7.92	.71	-9.95	28.86
	Control	Social Pressure	-39.34*	7.92	<.001	-58.74	-19.93
		Informational	-9.46	7.92	.71	-28.86	9.95

*. The mean difference is significant at the 0.05 level.

How did you perceive the tone of the text you read earlier?

[Open Question]

Social Pressure	- Demanding, kind of strict, sure about its opinion - Urgent - Harsh - Urging people to change their behaviour in a dominant way - I found it incentive - Very pushing and forcing to follow a specific direction - Neutral - Urgenz, adequate to the scale of the problem - shame/ guilt evoking, verbally aggressive, blaming - Demanding, motivative, confrontative - serious - explanatory, informative, non-accusative - Aggressive and blaming me - Demanding - Persuasive and passionate

	- yes, it was a clear message. - Mild pessimistic - Negatieve regarding short flys - Forceful - Accusing but respectful - quite suggesting - I found the text very direct and very useful; it is a much needed read and topic to talk about with as many people as possible. - Concerning
Informational	- Okay - Informative, mostly neutral yet leaning towards a anti-flying approach - Leading and disparaging - Encouraging - Nice, informative, not assertive - Assertive in a good way - Ok - Educational and thought-provoking - Engaged - Informative, ecouraging, trying to convince me - Persuasive - well - It shows that there is some responsibility on the individual and that we can have an impact if we make changes about the way we travel - objective information - Adequate - Neutral - nothing new - motivating to reduce flying, giving power to the individual - neutral - Fine, clear that the writer is against large emmissioners - pressing - very concerned - Direct - persuasive and persecutory - Concerning
Control	- Somewhat negative, potentially critical to the reopening of airports - ? - The text about the airport sizes and traffic? (It was a while ago). I would say objective, just stating info and facts. - Concerned - neutral to positive, informative - concerned - Fine - Informative - No idea - Informative but neutral - factual - Neutral. Pretty objective. Exposed the information in a clear way. - Informative - Positive - Dry

	- Neutral - Positive - Business-like, matter-of-fact - Neutral - Neutral - Informational and concerned - Trying to elicit potty for the airports and the workers there - factual - Very dry.

How did you feel while reading the text?

[Open Question]

Social Pressure	- Pessimistic - I did not feel guilty, as I do not fly. As a person that is taking the airplane often, I would feel ashamed and guilty and bad and maybe also would feel the need to defend myself. - Motivated, though pressured, anxious, pessimistic - Kind of tuned out the message because i felt attacked - It made me angry - a little bit guilty - Not great - Offended - Guilty for using flying as a means of transportation - I had mixed feelings. The message was clear and agreed with it, but I can imagine it having counteractive effects, as it is not possible for everyone to choose other means of transportation. In that case, it feels like placing blame on an individual level - Guilty - unsurprised - informed, encouraged to continue avoiding flying - Ashamed - Agreeable - Board - I felt a little bit assaulted and guilty for my choices in travelling. - Neutral - I felt a little sad, like i'm not doimg enough about climate change. - Guilty - i agreed for the most part - I felt bad about the situation of the world. I think more people should opt out of flying, even though it might be cheaper than train. I also, in general, much prefer to take the train. - Anxious and guilty
Informational	- I stopped flying altogether (if avoidable 2 years ago) but the text alleviated some of the guilt I had and made me think that maybe I don't have to sit in a train for 9 hours every time I go home

	- Appealed to and interested - Inclined to agree - I felt guilt for my actions of flying - Fine. I can handle the text's reality. - Good, I agree with the statements made - Guilty yet slightly defensive - Ok - FIne - indifferent - Agreeing - Judged - I felt interested and good in general - Activated - Quite neutral, the information was not new or surprising to me - upset - I felt kind of guilty because I wasn't aware of the fact that the co2 emissions are so huge for a flight - good, because someone else is writing, what i think - thoughtful - Neutral - concerned and pushed - Guilty, unpleasent - somewhat guilty, but mostly helpless - afraid
Control	- Neutral - Okay - Interested and immersed - Worried - Irrelevant - Powerless, worried - Neutral - ? - Guilty, anxious - Ok - Neutral and bored - Informed? - angry - neutral - concerned - worried - Made me think about how many people actually fly around Europe, and the world. And how we maybe can find other ways of transportation that are more efficient, affordable and less contaminating. Such as trans for example. - Guilty - Neutral - I felt like we are missing out on an opportunity - Neutral - Shocked by how much flying actually decreased since the pandemic - worried - Bored.

Before we end this survey, we still have a few questions about yourself.

What is your age range? [18-21, 22 -25, 26-29, 30-33, older]

What gender do you identify as? [Male, female, non-binary/third gender, prefer not to say]

When it comes to political orientation, we often refer to 'left' and 'right'.

Where do you see your own political views on this spectrum? [Left – Right, 10-item Likert scale]

Thank you for participating in this study!

In the next screen you will be shown your pseudonymized random code in case you want to retract your data in the future.

Debriefing

This research is conducted as part of a Master's Thesis.

The aim of this study was to find out how social pressure and informational content influence perceptions of ambivalence. Participants were asked to read a text similar in content, yet different in presentation, depending on the condition they were in. While one condition made appeals to normative, interpersonal, and informational cues, the other was mainly based on informational cues. Participants in the control condition read a text ranking the busiest airports within Europe in 2019. We will study whether, on average, the different conditions have different effects on the ambivalence people experience in the frame of societal debates.

We would like to remind you that you may withdraw from the study, without having to provide a reason. In case you want to retract your participation, you can do so until 30.06.2022. In this case, or in the case you may have any other questions, please feel free to to write an email to: l.smidt.1@student.rug.nl

More information?

Do you have questions/concerns about the research? Or would you like to receive more information about this research?

Please send an e-mail to Lea Smidt, l.smidt.1@student.rug.nl, or Gonneke Marina Ton, g.m.ton@rug.nl.

Do you have questions/concerns about your rights as a research participant or about the conduct of the research? You may also contact the Ethics Committee of the Faculty of Behavioural and Social Sciences of the University of Groningen: ec-bss@rug.nl.

Do you have questions or concerns regarding the handling of your personal data? You may also contact the University of Groningen Data Protection Officer: privacy@rug.nl.

Random Pseudonymized Code generated for the participant by which they can be identified until data preparation