Perceptions of Climate Change and Covid-19 risks and the Influence on Air Travel Behaviour in Norway

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MAPSYK360, masterprogram i psykologi,

Studieretning: Master i Sosial og Kognitiv Psykologi

ved

UNIVERSITETET I BERGEN

DET PSYKOLOGISKE FAKULTET

HØST 2021 / HØST 2022

Word Count: 16847

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Abstract

The study examined the relationship between Covid-19, climate change risk perception and travel behaviour among air travelling students in Bergen, Norway. Data was collected using a survey that was distributed in spring 2022 (n = 237). Results showed strong, positive correlations between perception and travel risk perception for climate change, and travel risk perception and travel behaviour for both climate change and Covid-19; moderate, positive correlations for perception and travel risk perception for both climate change and Covid-19, and a low, positive correlation between perception and travel risk perception for Covid-19. There were also moderate, positive correlations between perception for Covid-19 and climate change, and travel behaviour for Covid-19 and climate change. In regression analyses, both perception and travel risk perception were able to contribute to explaining travel behaviour, while for climate change only travel risk perception could add explanation to the model, while perception added almost no extra explanation. This suggests that of the two variables for risk perception, only travel risk perception is important in influencing travel behaviour for climate change, while both risk perception variables influence travel behaviour for Covid-19. The only demographic variable found to have a significant difference, was gender, with women scoring significantly higher than men on travel risk perception for climate change and travel behaviour for both climate change and Covid-19. The findings suggest that risk perception influence travel behaviour, but this influence varies for different situations.

Keywords: Air travel, climate change, Covid-19, risk perception, travel behaviour

Sammendrag

Studien undersøkte forholdet mellom Covid-19, klimaendringer, risikopersepsjon og endringer i reiseatferd blant studenter i Bergen, Norge. Data ble samlet gjennom en spørreundersøkelse som ble delt ut i våren 2022 (n = 237). Resultatene fant sterke korrelasjoner mellom persepsjon og risikopersepsjon for reise for klimaendringer og mellom risikopersepsjon for reise og reiseatferd for både klimaendringer og Covid-19; moderate, positive korrelasjoner mellom persepsjon og risikopersepsjon for reise for både klimaendringer og Covid-19; og en lav korrelasjon mellom persepsjon og risikopersepsjon for reise for Covid-19. I tillegg var det en moderat korrelasjon mellom persepsjon for Covid-19 og klimaendringer, og endringer i reiseatferd for Covid-19 og klimaendringer. I regresjonsanalyser bidro både persepsjon og risikopersepsjon for reise til å forklare endring i reiseatferd, mens for klimaendringer var det kun risikopersepsjon for reise som bidra til å forklare modellen, mens persepsjon bidro med veldig lite ekstra forklaring. Dette tyder på at av de to risikopersepsjonsvariablene, var det kun risikopersepsjon for reise som påvirket reiseatferd for klimaendringer, mens både persepsjon og risikopersepsjon for reise hadde en påvirkning for reiseatferd for Covid-19. Den eneste demografiske variabelen som hadde signifikante forskjeller var kjønn, hvor kvinner scoret høyere enn menn på risikopersepsjon for reise for klimaendringer og endring i reiseatferd for både klimaendringer og Covid-19. Funnene tyder på at risikopersepsjon påvirker reiseatferd, men denne påvirkningen varierer mellom situasjoner.

Nøkkelord: Flyreise, klimaendring, Covid-19, risikopersepsjon, reiseatferd

Preface

Through earlier studies and work, I have found a growing interest in applying psychology to better understand the relationship between human behaviour and hazards. So, I intended to write my master's thesis on either climate change or Covid-19. I found a supervisor who studied climate change, and he recommended combining these two themes. As I wrote my master's thesis during the Covid-19 pandemic, this was the perfect opportunity for this research. The work process turned out to be long and hard, with issues related to data collection, as well as getting sick multiple times, among other things from Covid-19.

I am grateful to my supervisor, Usman Isyaku, Postdoctoral fellow at the University of Bergen, who has helped me throughout the process of this study. He has been a great help and has advised me in planning the study as well as conducting the data and answering questions and giving advice for whatever issues I had. I am also grateful to everyone who participated in the study, as well as the people who helped me with stands and distributing the survey to participants.

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Over the last decade, travel by plane has had a continuous growth going from just over 5 000 billion passenger-kilometres performed in 2011, to closer to 9 000 billion passenger-kilometres in 2019 (International Civil Aviation Organization, 2020). In 2018 the industry was expected to have a compound annual growth rate of 3.5% for the next two decades (The International Air Transport Association, 2018). This massive growth in air travel that was taking place before the Covid-19 pandemic has led to air travel becoming a regular part of our lives, and people being able to experience faraway places all over the world that decades ago would be almost impossible to reach. In 2014 61% of the Swedish population reported flying within the last twelve months (Hopkinson & Cairns, 2020), and the numbers were likely similar in Norway, where the current study is taking place. For certain parts of the world, air travel had become a normal occurrence and part of everyday life, with no clear obstacles ahead.

Despite this, it is estimated that less than 20% of the world's population has ever been on a plane (Rosen, 2017). This indicates that even though air travel has become an opportunity for a growing number of people in certain countries, for the majority of the world population it still is not. As will be seen in the next paragraphs, there are negative effects of air travel, such as climate change and the spread of the pandemic, Covid-19. The unfairness in the availability of air travel strengthens, as these issues, caused by a relatively small group of people, lead to global consequences that can be severe.

The massive growth in aviation has not only had positive effects, and aviation is considered one of the top ten emitters, being responsible for an estimated 4.9% contribution to the problem of global warming (Climate Action Network & International Coalition for Sustainable Aviation, 2016). Considering less than 20% of the population has been on a plane (Rosen, 2017) the contribution to global warming for the people who fly regularly is large. In a study conducted by Hares et al. (2010), the participants to a strong degree identified aviation

as a contributor to climate change but did not take it into account when planning their holidays. As such, if aviation had continued its growth and people had continued to travel by plane without taking into consideration the effects it would have on climate change, aviation would probably have continued to emit, and with growth in the aviation industry, there would probably be a simultaneous growth in emission from aviation.

With the global Covid-19 pandemic which was announced as an outbreak on 30 January 2020, and declared as a pandemic on 11 March 2020 (World Health Organization, 2020) aviation got a crack. On 14 March 2020, the Norwegian Ministry of Foreign Affairs advised against travelling to any other country unless strictly necessary (Regjeringen, 2020a). On 15 March 2020 foreigners without a residence permit arriving at the Norwegian border would be expelled (Regjeringen, 2020b). With these restrictions and similar restrictions in other countries making it almost impossible to travel across the borders of countries, air travel got a massive hit, and went down 65.5% from 2019 to 2020, and was just under 3 000 billion passenger-kilometres in 2020 (International Civil Aviation Organization, 2020).

This massive change in air travel and restrictions put up by countries as air travel was considered dangerous, seem to, at least contemporary, change the way people perceive air travel. For people who flew regularly before Covid-19 many saw it as their right to travel by plane, and considered most of their trips as having importance (Gossling et al., 2019). However, when the Covid-19 pandemic was spreading throughout the world, many countries, Norway included (Regjeringen, 2020a), advised to avoid travel unless it was necessary to avoid further spread of the virus. As a result of the Covid-19 pandemic, people's impressions of non-essential travel has changed, and a study by Lamb et al. (2021) found that things like work meetings and conferences were now conducted virtually and that participants didn't expect business travel to go back to how it was before Covid-19. This suggests a contemporary change in perception of air travel, from being considered as having value and

being a right, to being considered to a degree unnecessary as well as dangerous. This shows that with an overhanging crisis, we are not just willing, but also able to change our air travel behaviour.

Air travel is, as mentioned, a factor for both climate change and Covid-19. For climate change, carbon emissions from airplanes is a large contributor to climate change (e.g. Climate Action Network & International Coalition for Sustainable Aviation, 2016), while for Covid-19 air travel has had a strong impact on the spread of the disease, as air travellers helped spread the virus around the world. Because of this, a stronger understanding of air travel behaviour and what affects this travel behaviour will help in the understanding of people's decision-making. As there are certain risks for travelling both from climate change and Covid-19, this study will study how risk is perceived for climate change and Covid-19 and how this risk perception influences travel behaviour.

Relevant Literature

There is a fair amount of research examining the relationship between perceived risk or worry for climate change and the effect it has on air travel behaviour (e.g. Arnadottir et al., 2021; Hares et al., 2010; Higham & Cohen, 2011). As Covid-19 is a relatively new situation, there is still limited research done studying this crisis, however, a few studies have researched perceived risk for Covid-19 and the influence it has on air travel (e.g. Chua et al., 2021; Lamb et al., 2021; Neuburger & Egger, 2020), as well as studies looking at other diseases with outbreaks further back in time (e.g. Cahyanto et al., 2016), which can still give important insight into how people react to epidemics and pandemics. At the time this study was conducted, only one study was found comparing air travel for climate change and Covid-19 (Kallbekken & Sælen, 2021).

Risks, risk perception and worry

For both climate change and Covid-19, the studies referred to in the current study use different concepts related to risk perception, such as worry, fear, concern, and uncertainty. These words reflect different aspects of similar phenomena. The current study uses two of these concepts, namely risk perception and worry, which are related concepts, but according to Sjöberg (1998), risk perception refers to a more intellectual judgement, while worry refers to an emotional reaction. In the current study, worry is used in one question, specifically asking the participants about worry. This question is part of a factor which is named "perception", while another group of questions asks for "travel risk perception". Both these factors are considered as measuring different aspects of risk perception. As such, in the current study, these two concepts are used according to the way Sjöberg (1998) define them. Since a lot of the relevant literature does not use definitions for these two concepts, it makes it harder to properly compare different findings. When compared in the current study, the word used in the original text is used, while worry for the current study is used to refer to the question about worry, and risk perception is the two factors measuring perception and travel risk perception. As the wording and defining of the concepts vary, the comparisons need to be interpreted as measuring related things, rather than the exact same phenomenon and as such, differences in findings may to some degree be a result of different conceptualizations.

The risks of air travel during the Covid-19 pandemic are numerous. People may catch the disease which can be dangerous for themselves, or they may infect others which causes further spread of the disease and this is why many governments decided to close their borders and advise against travelling. In addition, when countries were more open and people were allowed to travel, the situation could change rapidly, and borders could close down on short notice as was the case in Norway, where borders closed for non-Norwegians and people with legal residency only one day after this regulation was announced. As a result of the rapidly

changing situation and regulations, flights could get cancelled at a short notice and quarantine rules were changing rapidly. This meant going abroad could cause issues for work and school and travellers could get stuck in foreign countries. If people got sick while abroad that could further lead to issues with health insurance, in addition to health care situations being different in different countries. As many hospitals struggled to keep up with the number of infected, there was no guarantee of getting health care if needed. Overall, the risks associated with travel during Covid-19 were numerous, from economic risks and risks of quarantine, to risks of infection, spreading the virus, and in some cases even death.

For climate change, the risks are different, as the main risks are not associated with staying on a plane or complications while travelling, rather, the main risks are that the emissions from air travel will lead to global climate change. As the climate is heating up and we are getting more extreme weather (World Economic Forum, 2018), the consequences of air travel give rise to a global risk where the world likely is facing different dangers, such as food and water shortages, forest fires and even new pandemics as the changing climate may force animals to relocate to new habitats, which increases the risk of new diseases spreading to humans (Carlson et al., 2022).

Even if the main effects of climate change are expected to be yet to come the world is already starting to face disasters that are considered as having an increased likelihood of occurring or as having increased consequences as a result of climate change. To mention some cases where climate change has been mentioned as a contributor, 8 of the 20 largest forest fires registered in California occurred between 2017 and 2020 (California Air Resource Board, 2020); there is an increasing trend in forest lost in forest fires in Australia between 2001 and 2019 (Tyukavina et al., 2022); there was a huge flood in Europe leading to 184 deaths in Germany and 38 in Belgium while destroying infrastructure and homes (World Weather Attribution, 2021); and also for Norwegians disasters that may be related to climate

change are getting closer, with a landslide in Norway killing 10 people and destroying the homes of many more (Regjeringen, 2021). None of these disasters are purely a result of climate change, but in all the mentioned disasters, changes in the climate have been considered as potential factors leading to the disasters. In addition, there are links between climate change and the Covid-19 pandemic, as climate change may have been a contributor to the pandemic, and climate change together with other human activities, such as deforestation, is expected to lead to higher risks for pandemics (Arora & Mishra, 2020). As habitats are lost or changed and humans move further into land that used to be uninhabited, animals get in contact with other animals as well as humans. This in turn leads to a higher risk of "zoonotic spillover", where pathogens jump from animals to humans, which can lead to epidemics and pandemics such as the Covid-19 pandemic (Arora & Mishra, 2020). This shows that the problems related to climate change are already upon us with our emissions, and damage to the world already has deadly consequences, and this also shows how superficially different crises, such as climate change and Covid-19, may be closely connected.

These disasters have far larger consequences for people living in the areas affected, however, as tourists travel all over the world, they may get caught up in disasters while travelling. As such, climate change is starting to pose a risk while travelling not just because of the emissions and effects on the climate, but also for the individual as there is a chance of getting caught up in a disaster or catching a deadly disease and bringing it back home. As climate change is expected to lead to more disasters, this may turn into a risk for tourists, and influence the way air travel is perceived, and how air travellers perceive travel risk.

Air Travel and Risk Perception for Climate Change

When considering people's perception of climate change, the studies reviewed in the current study often measure two aspects: whether participants perceive climate to be changing

at all, and whether they perceive this change to be due to human contribution (e.g. Hares et al., 2010; Poortinga et al., 2019). Poortinga et al. (2019) use the terms “attribution scepticism” and “trend scepticism”, where the first is scepticism to whether there is a human contribution to climate change, while the last is whether climate change is happening at all.

The awareness people report to have of climate change and the effect of air travel specifically on climate change varies between different studies. In a study conducted on tourists in the UK in 2010 Hares et al. (2010) found that their participants were uncertain about both whether climate change was happening at all, which would be trend scepticism, and what the human contribution to climate change was, which would be attribution scepticism. In this study, a lot of participants considered flying to have an impact on climate change, but they considered their own behaviour as having a negligible effect on climate change (Hares et al., 2010). Of the 34 participants in the study, not one considered the effects on climate change when they planned their holidays, and some of the younger participants even held a belief that they should travel more now, as it would get more difficult and more expensive in the future as a result of climate change (Hares et al., 2010). In addition to this many participants supported low-cost airlines, as they were of the opinion that this opened up travelling for the masses, and made it affordable and accessible for more people to travel overseas (Hares et al., 2010).

Arnadottir et al. (2021) found in a qualitative study of young urbanites in Iceland that they in general were aware of the impact of travel on climate change. Arnadottir et al. (2021) found further that despite their participants being aware of the effects of air travel on climate change, none of their participants was willing to completely avoid travelling abroad. In their sample there was no difference in awareness of climate change between people who were more or less willing to change their travel behaviour, however, they found that people who were more open to changing travel behaviour were less inclined to justify travelling abroad by

shifting responsibility or lack of responsibility, which they argued may indicate that a feeling of personal responsibility and deeper knowledge of the impacts of air travel on climate change may change travel behaviour (Arnadottir et al., 2021).

These two studies are conducted with over a decade between them, and in different countries, which may explain the seeming difference in awareness in their studies. In a cross-European study, Poortinga et al. (2019) found that the majority of Europeans think that climate change is occurring, but found substantial differences between countries, with trend scepticism ranging from 2.3% in Iceland to 16.5% in the Russian Federation, and attribution scepticism ranging from 4.0% in Spain to 15.4% in Lithuania. Venghaus et al. (2022) argue that there is a growing awareness of climate change in Germany, with a bigger focus on climate change and people demonstrating in the streets, which indicates changes over time in people's awareness of climate change. Thus, studies of older date may find lower degrees of concern for the climate than studies of a newer date, and studies conducted in different countries may show different degrees of concern for climate change.

Cognitive dissonance and the "flyers' dilemma". Higham et al. (2014) conducted a study on what they called the "flyers' dilemma", which they describe as the tension between the personal benefits of tourism and the concerns for the climate. In their study, they found that most people felt an urgency for climate concern, mixed with a sense of individual powerlessness. This may be why Arnadottir et al. (2021) found that despite a growing awareness of climate change, people were unwilling to change travel behaviour.

Cocolas et al. (2020) found in a study that even people who were concerned about the effects of air travel on the environment, did not consider the cost on the climate to be significant enough to be worth changing behaviour for. Barr et al. (2010) got similar results and found that even the participants in their sample who were the most committed to

environmental actions and would undertake multiple environmental activities, would only have a basic commitment to off-setting and taxation on flights. This group of environmentally engaged people also tended to fly the furthest, and would rather pay taxes on flights than cut flying (Barr et al., 2010). The participants who were conscious of climate change were unwilling to say that flying was a bad thing and tended to argue that flying was in principle good, and the negative consequences had to be dealt with in innovative ways. Overall, Barr et al. (2010) concluded that a lot of consumers are unwilling to limit their flying habits to reduce their impact on climate change. In another article, Barr et al. (2011) got similar findings, as the participants in the study who were the most environmentally committed at home also were the ones who travelled the most and the longest. However, they also found that the people who were most committed to the environment at home also were more willing to consider measures to reduce the effects of air travel on climate change. However, their data also suggested that people with higher incomes tended to travel more than people with lower incomes. This indicates that the people who care the most about the environment aren't necessarily the ones who travel the least, as they may also be the ones with the means to travel.

Overall, there seems to be a cognitive dissonance, where a lot of people are aware of the effects of air travel on climate change, yet few people are willing to change their travel behaviour to limit their contribution to climate change, and people find excuses for why they still can justify air travel.

People who have quit air travel for climate change. Wormbs and Soderberg (2021) conducted a study where they researched people who already have quit air travel for the sake of climate change and their rationales for quitting air travel. They found that people usually had several motives for why they quit instead of just one, and of these reasons, fear and worry

for climate change were important (Wormbs & Soderberg, 2021), as people quit air travel for reasons such as worry for lack of drinking water and fear of fires and drought. Motives also included experience with what people perceived as climate change, such as record-breaking hot summers, forest fires and sinking levels of groundwater, which made people fear the consequences of climate change.

The most common motive to quit or dramatically reduce air travel was knowledge about climate change and the effect of air travel (Wormbs & Soderberg, 2021). As people realised how serious the problem of air travel is for the climate and global averages for pollution, and what levels would be needed to meet the Paris Agreement, the candidates found limiting air travel to be a way to lower their own emissions (Wormbs & Soderberg, 2021). For a lot of participants, the decision to quit flying was the realisation of the seriousness of climate change and the effect of air travel, and the feelings of guilt and inner conflict. By quitting air travel the participants overcame their cognitive dissonance (Wormbs & Soderberg, 2021).

Norway and other countries on air travel and climate change. Norwegians travel frequently by air for work or to see family, and they saw this as a consequence of the geography of the country and the lack of other means of transport (Higham & Cohen, 2011). People also perceived a need to go to hotter countries, and regular trips to other European countries were a norm. Higham and Cohen (2011) found that their participants were reluctant to compromise on travel as they saw it as important for different reasons, such as broadening horizons, personal identity and the upbringing of children, and people would rather change other aspects in their life for limiting their emissions than stop travelling. They found that people were not in denial of the consequences of air travel on the environment, rather they

accepted the risk and would continue flying while feeling guilt and a sense that they should be more concerned (Higham & Cohen, 2011).

In their study, Higham and Cohen (2011) looked at Norwegian's perceptions of climate change and long-haul air travel. They found that their sample had widely held climate concerns and acknowledged the significance of human contributions. Climate concern was quite mainstream, and participants reported efforts to reduce individual emissions in daily life such as reducing car use and purchasing local food (Higham & Cohen, 2011). However, Higham and Cohen (2011) also found evidence of a sense of insignificance of efforts in domestic life, to a point where some participants would neglect climate change as a daily concern.

In another study, Higham et al. (2014) compared Norwegians, Brits and Germans on climate perception and change in travel behaviour. They found that Norwegians felt a strong sense of personal responsibility, while participants from the UK felt a general lack of personal responsibility. They found further a strong reluctance to compromise on air travel, especially for the Norwegian and UK participants. Overall, earlier studies suggest that Norwegians attribute climate change to be affected by humans, are aware of the risks of travelling by air, but at least before Covid-19, rather unwilling to change their air travel behaviour.

Poortinga et al. (2019) found in their cross-European study that Norway had high attribution scepticism, at 12.0%, despite a mid-sized level of trend scepticism, at 7.1% and concern for climate change just over the average of the European countries. This indicates that despite being concerned about climate and thinking there are changes in the climate, based on this finding Norwegians compared to other European countries have a stronger tendency to contribute climate change to other factors than human activity. Whether this is in contrast with the other studies mentioned or not, is hard to know, as the percentages of Poortinga et al. (2019) are high compared to other European countries but still, the vast majority of

Norwegians do not have high attribution or trend scepticism, and so this seeming difference may be in the definition of what would be high and low worry or scepticism for climate change in different studies.

Air Travel and Risk Perception for Covid-19

With the closed borders as a result of Covid-19, it was natural that air travel went dramatically down simply because people were not allowed to travel across borders and changing regulations added obstacles to travel. It is likely that people's perception of travel also got changed with air travel posing an immediate threat directly to the individual travelling, but as regulations limited the possibilities of air travel (e.g. Regjeringen, 2020a, 2020b), it is unknown whether the decrease in air travel (International Civil Aviation Organization, 2020) is a result of convenience or a result of perceived risk for air travel.

The decrease in air travel was likely, at least to some degree, influenced by risk perception as earlier epidemics have been found to influence how people perceive safety for travel. In the US people avoided air travel due to confirmed cases of Ebola in 2014 (Cahyanto et al., 2016) and the authors found that the strongest predictor for travel avoidance within the US during the Ebola outbreak was perceived risk, with those perceiving higher risk having a higher propensity to avoid travel.

Neuburger and Egger (2020) found that after Covid-19 was just declared a pandemic, 86% of the sample perceived high or relatively high travel risk perception, and these people to a much larger degree intended to change or cancel travel plans compared to the other 14% of the sample who had both travel risk perception and travel behaviour, such as intention to change or cancel travel plans, around the midpoint of a five-point Likert scale. This fits well with the findings by Cahyanto et al. (2016), and both studies show that people who perceive high risk from travel during dangerous diseases are more likely to avoid travel.

In a study in the United States conducted by Lamb et al. (2021) they found that their participants had decreased their air travel with on average 93% fewer trips after the onset of Covid-19. A common theme they found was that their participants had a lack of trust for other people, not knowing if other people were as clean as themselves or understood contagion risks. They argue that distrust of other people is likely a primary source of fear. Chua et al. (2021) found that health risk perception led to negative attitudes towards international travelling. They also found that while perceived uncertainty predicted travel avoidance in the short term, it did not predict long-term travel avoidance (Chua et al., 2021). The studies reviewed were conducted earlier in the pandemic, and so the way people perceive travel risk may have changed, as people have seen that the pandemic has been long-lasting and with long-term consequences for travel, and so, even though these studies have similar findings, the current study may have differing results, simply because of changing times.

Differences in Perception and Travel Behaviour for Covid-19 and Climate Change

Although most people in Norway did consider travel by air to have a risk for climate change, this risk will be in the future, possibly at some faraway location while with the Covid-19 pandemic, the risk became immediate. The risks associated with climate change would have effects around the world, but not necessarily on the person travelling, it might feel more distanced, while for Covid-19 the risks were potentially for the individual travelling by air, while travelling. This means that even though these two crises may have similarities and both fit with air travel, the way people perceive risk for these two crises may be different as a result of differences between risks for the two crises.

Kallbekken and Sælen (2021) have conducted a study comparing climate change with Covid-19. In their study, they looked at public support for restricting air travel. In their study, they found that support for the government to limit leisure travel was larger for Covid-19

(70.2%) than for climate change (51.7%) while 52% of their respondents saw Covid-19 as an immediate or near threat compared with 11% for climate change. This study was conducted in Norway and so the results may differ from other countries, but as the current study will also be conducted in Norway, it is fair to assume that the findings of the current study will be similar to the findings in Kallbekken and Sælen (2021), however, as the current study is conducted at what seems to be the end of the Covid-19 pandemic, the perceived threat is likely not as high as it was earlier in the pandemic, which may give different findings.

Kallbekken and Sælen (2021) found that perceived threat was a factor that led to support for travel restrictions, both for climate change and Covid-19. Despite this, restrictions for Covid-19 had higher support than restrictions for climate change which Kallbekken and Sælen (2021) argue is because Covid-19 is seen as a more immediate threat than climate change, and therefore the restrictions are assumed to last shorter and be more effective. As the Covid-19 pandemic has lasted for about 2 years as of the date when data was collected for the current study, it is fair to assume that people still perceive Covid-19 as somewhat immediate but not to the same degree as at the beginning of the pandemic. The Covid-19 pandemic is seemingly going towards an end, but as new, potentially dangerous, mutations may still come, restrictions may still come and go, which may lead to a continued high fear of Covid-19. On the other hand, even though the main consequences of climate change are still likely to come, the lack of feeling of immediacy may affect people's willingness to change despite studies finding that most Norwegians believe in and worry about climate change (e.g. Higham & Cohen, 2011; Higham et al., 2014; Poortinga et al., 2019).

Demographic Differences

Cahyanto et al. (2016) found a positive relationship between being female and avoiding travel during the Ebola outbreak in 2014, while Neuburger and Egger (2020) found

higher risk perception for females than males. Neuburger and Egger (2020) also found that travel risk perception decreases with increasing age. Hansmann and Binder (2021) found a significant correlation between gender and age, and intention to reduce flying for climate change, where females had higher intentions of reducing air travel than males, and younger people had higher intentions of reducing air travel than older people. In their cross-European study Poortinga et al. (2019) found that when it came to trend scepticism, men had a stronger tendency to be sceptical, while when it came to attribution scepticism and climate concern, although men scored higher on attribution scepticism and lower on climate concern, these differences were insignificant. Age seems to be closely related to climate change concern, with older people being less concerned about climate, more sceptical of there being a trend of climate changing, and more sceptical of the human contribution to climate change (Poortinga et al., 2019). Overall, it seems that both age and gender have an influence on risk perception, with females and younger people perceiving higher risk for Covid-19 and climate change, age has an influence on travel behaviour, at least for climate change.

Methods

Sample

The current study has a quantitative research design, using a survey distributed to students. The data was conducted using accidental sampling as the student population would otherwise be hard to get a hold of, while accidental sampling made data collection an easier and faster process. As the situation was changing rapidly, a time-consuming sampling method would not be ideal. Participants were chosen based on accidentally being at the place of data collection when it was being conducted or belonging to groups where a link was sent; as well as self-selection, as posters were used, and participants chose themselves if they wanted to

participate. A survey was conducted over a total of two full months during February, March, and April 2022, using a sample of students in Bergen. 237 respondents completed the full survey and 49 participants had not travelled within the last two years, and only consented and answered that specific question.

According to Bergen Kommune (2019), there were about 35000 students in Bergen in 2019. Based on this number and using a Confidence Level of 95% and a Margin of Error of 5%, an ideal sample size would be 380 participants. This was the intended sample size, but as the collection took longer than planned, and the situation was rapidly changing, it was decided to end the survey after a total of 2 months from the start of the data collection to the end of the data collection, to avoid responses differing based on time of collection. Because of that, the ideal sample size based on the population group was not met. However, based on the analyses being used, with correlation, linear regressions and a one-way ANOVA a sample over 200 should be sufficiently large for approximating normality (Statistics Solutions, 2013).

Before the survey was conducted a pilot survey was conducted on 10 participants while the author was available for explaining and listening to any thoughts the pilot survey participants had. No major changes were made, but certain minor changes in word choices and formulations were made clearer.

As the survey intended to measure risk perception for travel and travel behaviour, it was important to find a group of people who are accustomed to travel. At first, the intention was to ask people waiting at the airport in Bergen as that would be an easy target group as well, but the airport had a policy against surveys being conducted at the airport. Another group who are very likely to travel are international students as many will go back home to visit their families, or they will travel within the country to experience most of it while in the country. As Norway is both difficult to travel to, and within, by other means than by plane,

international students will likely travel by plane, and so this group was chosen as the new intended sample group.

To collect data, posters were put up at places where international students are likely to be, a link was sent to a Facebook site for international students in Bergen and a stand was held outside a building where a lot of international students live. This gave a few participants, but not close to the number needed based on the size of this group. To get enough participants within a short time frame, the sample was extended to include all students in Bergen, as a lot of students in Norway do travel. As the study asks about travel behaviour and change in travel behaviour it was important to make sure that the sample has experience with travelling by air, and so a requirement asking whether the students have travelled by plane within the last two years was added. If people had not travelled since the start of Covid-19, they might not perceive the same risks for travel or have a need to consider the risks of either climate change or Covid-19 when travelling, as it would not be relevant for them. Including all students, new posters were put up around the university in addition to new stands and visitations in lectures for collecting participants. People sitting at different cafeterias and libraries around the University in Bergen were asked if they would be willing to participate in the survey to get enough participants. This proved to be a slow process, possibly because a QR code was used and participants could complete the study at any time which led to many possible participants not completing the survey. A total of 412 participants answered the first question, while only 286 (the group who completed the full survey, and the group who had not travelled) completed the survey. In addition, as the survey was online, there were issues with the site used for collecting data, which led to a delay in collection and data lost, as the survey needed to be remade due to technical issues. An unknown number of participants answering the first survey was thus lost.

Research Questions and Hypotheses

Both Covid-19 and climate change are ongoing crises, with links to air travel. For Covid-19, travel has been a way for the virus to spread all over the globe, and as air travel is the main way to travel internationally for people living in Norway, questions relating to air travel instead of simply travel makes sense. For climate change, air travel is considered one of the main contributors to pollution (Climate Action Network & International Coalition for Sustainable Aviation, 2016). For Covid-19 studies (e.g. Neuburger & Egger, 2020) have found that risk perception does influence travel behaviour; and for climate change, the risks pollution leads to for the climate have been found to influence how people perceive air travel (e.g. Arnadottir et al., 2021), and for some people have an effect on their travel behaviour (e.g. Wormbs & Soderberg, 2021). Hence there are links between risk perception for both Covid-19 and climate change, and air travel behaviour. In the current study, the goal is to examine this link.

This study has one research question:

How do Norwegian air travellers perceive risk for Covid-19 and climate change, and how does this risk perception influence travel behaviour?

This study has three objectives:

1. To examine climate change and Covid-19 risk perception among air travellers in Norway

2. To analyse the relationships between climate change risk perception, Covid-19 risk perceptions, and air travel behaviour among the study participants.

3. To analyse the relationships between demographic variables (age and gender) and risk perceptions and travel behaviour among the study participants.

The research question is supported by three hypotheses:

H1 There is a significant relationship between covid-19 risk perception and travel behaviour

H2 There is a significant relationship between climate change risk perception and travel behaviour

H3 There is a significant relationship between demographic variables for risk perception and travel behaviour

Survey Design

The participants were informed of the purpose of the study, how the data would be used and protected, received an email address of the author of this article in case of questions or issues, and had to consent if they were willing to participate. No personal data, or data that could identify a specific person, was included. There was also, as mentioned, a question asking whether they had travelled within the last two years. If the participants did not consent or had not travelled, they were sent straight to the end of the survey. The survey consisted of five demographic questions asking for gender, age, year of study, faculty and travel frequency by air; three questions relating to perception for Covid-19 and three relating to perception for climate change; six questions relating to travel risk perception for Covid-19 and five questions relating to travel risk perception for climate change; and finally six questions relating to travel behaviour for Covid-19 and five questions relating to travel behaviour for climate change.

For gender the options were “Female”, “Male”, and “Other / prefer not to say”; the last option consisting of two options together, to avoid questions that potentially could make certain individuals identifiable. For age there were 5 options, ranging from “<20” to “>35”, with groups between containing 5 years each. These young age groups were chosen, as the

study was conducted on students, and therefore the respondents will be far younger than for the main population. For year of study, the options ranged from “1” to “>5”, with each option between containing 1 year each, with “>5” being the highest, as five years is the amount of time it would take for most people in Norway to complete a master, and as such most participants would be between one and five years of studying. For travel frequency there were two questions, one asking for the time before the Covid-19 pandemic, the other after. Both were the same otherwise, with categories ranging from 0 times per year to >5 times per year. These options were the same as Neuburger and Egger (2020) used in their survey. Another demographic question for either country or continent respondents were from was considered, as the sample include both Norwegian and international students, but as the number of international students in the sample population is rather small, that may make some respondents identifiable, and so, to keep the anonymity of the respondents intact, it was decided not to add such a question.

The survey was inspired by the survey conducted by Neuburger and Egger (2020) who were interested in perception of Covid-19 and travel behaviour, as well as the study conducted by Kallbekken and Sælen (2021) who examined the differences between climate change and Covid-19 in support for air travel restrictions. All questions except consent are reported in Table 1 and Table 2. The questions inspired by Neuburger and Egger (2020) were changed to fit air travel instead of all kinds of travel, in addition some questions were added and others were reformulated as the current study was conducted later in the pandemic. Questions in the survey by Neuburger and Egger (2020) that were not relevant for the current study, were not included. For climate change similar questions as the questions about Covid-19 were used but adapted to fit climate change.

For both Covid-19 and climate change there were 3 questions examining how people perceive each crisis, all inspired by Neuburger and Egger (2020), but for Covid-19 instead of

asking whether there “is a lot of fearmongering” the question asked whether there “is/was a lot of fearmongering” as the current study is conducted at a far later point in the pandemic, and many people who perceived there to be a lot of fearmongering in the past may not perceive it that way anymore, and so the questions were changed to catch perceived fearmongering in both the past and the future. For climate change it was kept the same, as it is unlikely that some participants would perceive there to be fearmongering in the past but not the present.

Next there were 6 questions for Covid-19 and 5 for climate change asking for perceived travel risk. For one of the questions for Covid-19 where Neuburger and Egger (2020) asked whether the respondents feared that tourists would carry the virus to their near surroundings, “new mutations” was used instead of “the virus” as the virus at the point of the current study was global but new mutations had brought upon new restrictions and so despite the country being free of restrictions and the current mutations fairly safe, people might still fear new mutations to spread and take precautions to limit the risks.

The next questions were 6 questions each for Covid-19 and climate change, asking about travel behaviour. One question asked for media reporting of Covid-19 in different countries, but for climate change it asked for the media reporting of climate change measures in different countries, as climate change exist in all countries but there will be differences in the measures taken in different countries, both when it comes to limiting climate change, and when it comes to safety precautions taken, such as measures for cleaner air. The question was not made any more specific for what kind of measure, as the question asked for the influence of media reporting. For Covid-19 two of the questions asked whether people would cancel trips to countries with many, or with few cases of Covid-19, while for climate change the questions were changed to ask whether people would cancel trips to countries with limited climate measures, or countries with many climate change related disasters. The reason for

asking about climate change measures and climate change related disasters are that climate change measures at the tourist destinations, such as climate friendly hotels, may reduce the total pollution from a trip; and that climate change related disasters will lead to some destinations becoming more dangerous and so people may perceive climate related risks for certain destinations, such as forest fires and floods.

The questions concerning climate change and Covid-19 were conducted by Likert scales where the participants were asked to rate how much they agreed with each statement, with five options for each question ranging from “Strongly disagree” to “Strongly agree”. The study was conducted using an online survey made using Qualtrics software, Version 3, 2022 of Qualtrics, copyright © 2020. The study was distributed as a QR-code people could scan to enter the survey and an anonymous link distributed to groups of people. After a couple weeks of collecting data there were issues with the survey, where the account was supposed to be updated, and afterwards, became impossible to log into, and so the survey was remade using the same software program, and the data collection continued after over a week of being unable to use the survey. The results from the survey were downloaded regularly and so most data from the first survey were saved, but as the first survey still was open and being distributed to potential participants, and the link and QR code were still useable, there were an unknown number of participants that got lost when the first account stopped working.

Statistical Analysis

The data was analysed using the statistical software The Jamovi Project (2021). Four of the perception questions concerning perceived fearmongering for both climate change and Covid-19, as well as whether the participants perceive climate change to be from natural causes only, and whether participants perceive Covid-19 to be only a flu (Table 2) were originally formulated so that high scores would imply low risk perception. These questions

were reversed, so high scores would mean high risk perception and low scores low risk perception. As such, all questions for risk would have the same direction. Some of the participants missed answers in between for the main questions, and one participant had a missing answer in travel frequency, this participant is not used when this variable is used. One-way ANOVAs were used to check for demographic differences, except gender, where the "Other / prefer not to say" group was removed for this exact analysis, as the group was not representative, with only two participants choosing this option. As there were thus only two options for gender, a t-test was sufficient. For certain questions means were used, as well as percentages of the sample based on proportions of the sample agreeing, being neutral, or disagreeing with statements to get an understanding of the sample and to compare specific questions to findings from earlier studies.

Each of the 6 groups of questions were computed into new factors, so that each participant had a score for perception, travel risk perception, and travel behaviour for climate change and for Covid-19 separately. As these factors are combined of different variables, the term "factor" is used to distinguish the different levels of data. The survey thus consists of demographic variables; two categories which are Covid-19 and climate change; six factors, three for each cateogry; and finally, the specific questions that are used both on their own and combined into the six factors. For the missing data for the questions related to climate change and Covid-19, the missing data was used as "0" when the factors were made, meaning the participants would not get a score in these factors, and the participants would thus only be used in the factors they had completed. The missing data for the factors ranged from two to five, (Table 3), meaning the percentages of missing data is for all factors less than 2% (0.73 - 1.83%).

The six factors are:

1. "Perception for Covid-19",

2. “Perception for climate change”,
3. “Travel risk perception for Covid-19”,
4. “Travel risk perception for climate change”,
5. “Travel behaviour for Covid-19”, and
6. “Travel behaviour for climate change”.

Perception and travel risk perception together measures risk perception but will be looked at separately as they show different aspect of risk perception. For the main analyses of the different factors, both a correlation matrix and linear regressions were used. The correlation matrix was used to see whether the factors that would be expected to correlate, did so, and as it is fair to assume that all six factors will have similarities, whether there were correlations, also where it would not be expected, such as factors for climate change correlating with seemingly unrelated factors for Covid-19. Earlier studies have argued that worry is part of trait anxiety (Eysenck & Van Berkum, 1992), and thus, people who worry tend to do so more generally, rather than specifically for certain situations. As worry is part of the perception factor in the current study, this tendency for worry to be general may result in a correlation between perception for climate change and Covid-19. For the other similar factors, namely the two factors for travel risk perception and the two factors for travel behaviour, no studies were found that indicate these will correlate.

Two linear regressions, one for climate change and one for Covid-19, were used to check whether the effects of risk perception, meaning both perception and travel risk perception, was a good model to explain variance in travel behaviour. This will make it possible to compare the two risk perception factors and to see if both are important for explaining variance in travel behaviour independently of each other.

Both correlation and linear regression requires continuous data, while Likert scales are ordinal, but as the means of each category were used to make new factors, the new values are

continuous, and as such can be used for these analyses. As different analyses have different assumptions that need to be met, analyses were run to check whether these assumptions were met. The data was tested for outliers, using Q-Q plots, Box plots and violin plots. For normality, skewness and kurtosis were checked for each of the factors. In the t-tests, Levene's test was used to check for equality of variance. For the analysis, collinearity, normality (Shapiro-Wilk), Q-Q plots for residuals, residual plots and Cook's distance were checked depending on the analysis used.

Results

Sample Analysis

The 237 participants who had completed the survey and thus is the sample used for this study consisted of 151 (63.7%) female, 84 (35.4%) male and 2 (0.8) other / prefer not to say participants. As there are only 2 people who answered in the category "Other / prefer not to say", they will not be included when considering gender differences, as the size is not representable. As the survey was distributed at a university, the sample had a young age (Table 1), with most of the sample being between 21 and 25 years old.

Of all the people (not just the sample used for the main study) who completed the questions of whether they had travelled within the last two years 332 (87.1%) reported having travelled by plane within the last two years, while 49 (12.9%) reported not having travelled by air within these two years (Table 1), which means of students in Bergen, just over 1 in 10 students reported not having travelled by air within the last two years. The option "not received" is the group of people who received the survey before it was changed to include all students and that question was added, and so these are all international students. The reason for using the people who did not complete the survey as well for reporting of air travel within the last two years, is that this question was the first question after consenting to participate,

and so to get the best idea of the proportion of people who travel by air, this will give the best estimate.

Of the participants, 49 reported zero trips by air during corona (Table 1), which would be the last two years at the time of data collection. As there was a condition in the beginning asking whether people had travelled by air within the last two years, the group who reported 0 times per year during corona may have travelled only once, and so considered it to be the

Table 1. Frequency of variables

	n	%
Travel by plane within the last two years* (*N* = 395)		
Yes	332	84.1
No	49	12.4
Not received	14	3.5
Gender (*N* = 237)		
Female	151	63.7
Male	84	35.4
Other / Prefer not to say	2	0.8
Age (*N* = 237)		
20 and under	33	13.9
21-25	168	70.9
26-30	27	11.4
31-35	4	1.7
Over 35	5	2.1
Department (*N* = 237)		
Faculty of humanities	24	10.1
Faculty of law	36	15.2
Faculty of Mathematics and Natural Sciences	16	6.8
Faculty of Medicine	15	6.3
Faculty of psychology	34	14.3
Faculty of Social Sciences	81	34.2
Other	31	13.1
Year of study (*N* = 237)		
1	72	30.4
2	57	24.1
3	57	24.1
4	24	10.1
5	18	7.6
>5	9	3.8
Travel frequency before corona (*N* = 237)		
0 times per year	8	3.4
1-2 times per year	82	34.6
3-5 times per year	91	38.4
More than 5 times per year	56	23.6
Travel frequency by air during corona (*N* = 236)		
0 times per year	39	16.5
1-2 times per year	114	48.3
3-5 times per year	44	18.6
More than 5 times per year	39	16.5

Table 1. Frequency of demographic variables

*Total sample answering this question, for the rest of the survey it is the number of the sample who completed the full survey who is mentioned as number

closest category, otherwise, they may have misinterpreted the question, as the questions were formulated differently (last two years vs. during corona) or thought or remembered differently for each of the questions. As they at one of the questions have reported flying within the last two years, it was decided to keep them in the sample.

For all the factors assumptions were checked to see whether they are normally distributed. All of the factors were significant using Shapiro-Wilks' test (Table 3), but as the

Table 2. Mean values

	Mean (SD)
Perception of Covid-19 (Question 11_1-3)	*2.72 (0.73)*
The current situation about the coronavirus worries me a lot	2.11 (.0.95)
Coronavirus is just a new form of the flu (reversed)	3.18 (1.08)
I think there is/was a lot of fearmongering around the coronavirus (reversed)	3.12 (1.11)
Perception of climate change (Question 12_1-3)	*4.05 (0.70)*
The current situation about climate change worries me a lot	3.98 (0.97)
Climate change is from natural causes only (reversed)	4.57 (0.73)
I think there is a lot of fearmongering around climate change (reversed)	3.62 (1.19)
Travel risk perception for Covid-19 (Question 13_1-6)	*2.97 (0.60)*
Air travel is to a large extent responsible for the spread of coronavirus	3.44 (0.90)
The air travel industry will continue to be massively affected by the coronavirus pandemic	2.97 (0.88)
Staying on a plane is a risk, as there are many people from different countries, who could carry the virus	3.14 (1.00)
I fear that new mutations of the virus will be carried by travellers to Norway	2.95 (1.01)
Air travel should be limited to avoid further spread of the virus	2.13 (0.94)
Currently, it is risky to travel to destinations with a high number of cases of Covid-19	3.16 (1.06)
Travel risk perception for climate change (Question 14_1-5)	*3.66 (0.69)*
Air travel is a significant contributor to global climate change	3.90 (0.81)
The air travel industry will be massively affected by climate change	3.52 (0.90)
Air travel increases the frequency of climate change related disasters	3.55 (0.86)
I fear that climate change will have a negative impact on my immediate environment	3.87 (0.98)
Air travel should be minimized to avoid a larger impact on climate change	3.45 (1.11)
Travel behaviour for Covid-19 (Question 15_1-6)	*2.75 (0.67)*
My travel behaviour has already changed due to coronavirus	3.31 (1.15)
My travel behaviour is likely to change due to coronavirus	2.83 (1.12)
My travel to another country depends on how media is reporting about corona in that country	3.08 (1.13)
Currently, I would avoid travelling to countries with many reported cases of coronavirus	3.34 (1.12)
Currently, I would avoid travelling to countries with few reported cases of coronavirus	2.04 (0.90)
Currently, I would avoid trips by airplane due to coronavirus	1.93 (0.82)
Travel behaviour for climate change (Question 16_1-6)	*2.73 (0.82)*
My air travel behaviour has already changed due to climate change	2.72 (1.18)
My air travel behaviour is likely to change due to climate change	3.16 (1.13)
My travel to another country depends on how media is reporting about climate change in that country	2.34 (0.98)
Currently, I would avoid travelling to countries with limited climate change measures	2.36 (0.96)
Currently, I would avoid travelling to countries with many climate change related disasters	3.07 (1.21)
Currently, I would avoid trips by airplane due to climate change	2.75 (1.13)

Table 2. Mean and Standard deviation of questions and factors. Answers range from 1 to 5, with 3 being neutral. Factors are combined of the questions belonging to each category, with the question codes used for each factor in parentheses.

Shapiro-Wilk works better on samples sizes up to 50, while getting too sensitive afterwards (e.g. Elliott & Woodwards, 2007, as cited by Ghasemi & Zahediasl, 2012; Mishra et al., 2019), this alone does not necessarily determine that the factors are not normally distributed. Using measures for skewness and kurtosis instead, the factors were within what would be considered acceptable scores (Table 3), with skewness between -2 and 2, and kurtosis between -7 and 7 (Kim, 2013) and assumptions of skewness and kurtosis were thus met.

Looking at the Q-Q-plots and Box plots (Figure 1, see appendix), there were no outliers far out from the main group, and so no participants needed to be removed for the regression analyses to function properly. An issue was that there was a certain ceiling effect, especially when it came to perception for climate change (Figure 1.2, see appendix), where a big part of the sample reported very high, or the highest possible value for perception. This factor had a skewness of – 0.79 (Table 3), which is within acceptable levels. This may lead to

Table 3. Descriptives for the Variables

	Perception, Covid-19	**Perception, climate change**	**Travel risk perception, Covid-19**	**Travel risk perception, climate change**	**Travel behaviour, Covid-19**	**Travel behaviour, climate change**
N	232	232	235	234	235	232
Missing	5	5	2	3	2	5
Mean	2.72	4.05	2.97	3.66	2.75	2.73
Median	2.67	4.33	3.00	3.80	2.83	2.67
Standard deviation	0.726	0.701	0.595	0.686	0.669	0.816
Skewness	0.0611	-0.789	-0.335	-0.422	-0.423	-0.0594
Std. error skewness	0.160	0.160	0.159	0.159	0.159	0.160
Kurtosis	-0.280	0.320	0.103	0.302	-0.181	-0.0437
Std. error kurtosis	0.318	0.318	0.316	0.317	0.316	0.318
Shapiro-Wilk W	0.975	0.929	0.984	0.977	0.976	0.984
Shapiro-Wilk p	< .001	< .001	0.011	< .001	< .001	0.009

Table 3: Descriptives for the variables showing sample size and standard deviation, central tendency, distribution, and normality.

uncertainty with the results where this factor is included as a ceiling effect is an indicator that the variable is not able to distinguish the differences within the participants receiving high scores. However, as skewness and kurtosis were within the limits for a normal distribution and only the tail was lost with the ceiling effect (Figure 1.2, see appendix), it was decided to use all the factors for the analyses, while keeping in mind that this ceiling effect may influence the results of the analyses where this factor is included. As a normal distribution is more important for residuals than for the factors, and as the sample size is over 200, and so sufficiently large for approximating normality, the issues observed should not have a contribution to bias or inefficiency for regression models (Statistics Solutions, 2013). The issues will be kept in mind and assumptions will be examined for the specific analyses as well.

For travel behaviour related to climate change, there was another abnormality, in that most of the sample fell within somewhat of a normal distribution, but with an extra peak on the tail on one end (Figure 1.6, see appendix), as a group of the sample answered very low, while the main group followed a normal distribution with a mean that was far higher than this group. Looking at histograms where the factors were split by gender (figures not included), it became clear that almost all of this group with very low scores on travel behaviour related to climate change, were men, while women followed a far more normal distribution. As there are twice as many women in this study, this floor effect for men may be even stronger in a larger sample, or it may be a random finding, and thus be evened out with a larger sample. For all the factors, histograms and box plots indicated a more normal distribution for women than for men.

For checking whether there are differences in gender, a Student's t-test was first applied together with a Levene's test checking whether both genders had equal variance, as that is an assumption for conducting Student's t-test. The Levene's test showed that for four

of the factors, perception for climate change, travel risk perception for both climate change and Covid-19, and travel behaviour for Covid-19, this assumption was violated (Table 4). This fits with the finding while looking at the box plots for the different factors, women were found to have more normally distributed answers than men. Because of this difference in variance, a Student's t-test was used to report significance on the two factors where equal variance was not violated, which were perception for Covid-19 and travel behaviour for climate change, while a Welch's t-test was used instead on the other four factors, as this test can be used when there is a difference in group size and variance. Results for both Student's t and Welch's t is shown in Table 4.

When checking for normality with a Shapiro-Wilk test, five of the factors were significant (Table 5), meaning they were not normally distributed based on Shapiro-Wilk, but as mentioned, Shapiro-Wilk works better on smaller sample sizes (e.g. Elliott & Woodwards, 2007, as cited by Ghasemi & Zahediasl, 2012; Mishra et al., 2019). As most of the results with the Shapiro-Wilk tests were barely significant and with an acceptable sample size

Table 4. Independent Samples T-Test

		Statistic		df	p
Perception for Covid-19	Student's t	0.385		228	0.701
	Welch's t	0.381		165	0.704
Perception for climate change	Student's t	2.040	[a]	228	0.042
	Welch's t	1.928		138	0.056
Travel risk perception for Covid-19	Student's t	1.468	[a]	231	0.143
	Welch's t	1.371		140	0.173
Travel risk perception for climate change	Student's t	3.545	[a]	230	< .001
	Welch's t	3.289		135	0.001
Travel behaviour for Covid-19	Student's t	3.154	[a]	231	0.002
	Welch's t	3.030		148	0.003
Travel behaviour for climate change	Student's t	2.760		228	0.006
	Welch's t	2.664		151	0.009

Table 4: Independent sample t-tests for gender.
[a] Levene's test is significant ($p < .05$), suggesting a violation of the assumption of equal variances

Table 5. Normality Test (Shapiro-Wilk) for gender differences

	W	**p**
Perception for Covid-19	0.980	0.003
Perception for climate change	0.948	< .001
Travel risk perception for Covid-19	0.991	0.147
Travel risk perception for climate change	0.987	0.028
Travel behaviour for Covid-19	0.984	0.009
Travel behaviour for climate change	0.987	0.038

Table 5: Normality test for independent sample t-test, with gender as grouping variable. A low p-value suggests a violation of the assumption of normality

(Statistics Solutions, 2013) these results alone are not enough to conclude that the variables are non-normally distributed. Checking Q-Q plots the factors follow linearity (Figure 2.1-6). As such, the factor "perception for climate change" again seems to violate the assumption of normality as there is a tendency towards an s-curve, which as mentioned, is likely a result of a ceiling effect, while the other factors seem to be normal. All factors were included in t-tests to see what the results were, while keeping the possible non-normality of "perception for climate change" in mind.

With gender as dependent variable, three of the factors had significant differences between men and women, all with women having a higher average than men. These factors were "travel risk perception for climate change", with women (M = 3.8, SD = 0.6) perceiving higher risk for the climate from travel than men (M = 3.5, SD = 0.8); "travel behaviour for Covid-19", with women (M = 2.9, SD = 0.6) reporting higher change for Covid-19 than men (M = 2.6, SD = 0.7); and "travel behaviour for climate change", using a Student's t-test, with women (M = 2.8, SD = 0.8) reporting higher change in travel behaviour than men (M = 2.5, SD = 0.9).

The three other factors also had higher averages for women than men, with women (M = 2.7, SD = 0.7) scoring marginally higher than men (M = 2.7, SD = 0.7) for "perception for Covid-19"; women (M = 4.1, SD = 0.6) perceiving higher risk than men (M = 3.9, SD = 0.8) for "perception for climate change"; and women (M = 3.0, SD = 0.5) scoring higher than men

(M = 2.9, SD = 0.7) for "travel risk perception related to Covid-19". As perception for climate change was not significant using a Welch's t-test, but significant if a Student's t-test had been used (Table 4), the result here may have been affected by the mentioned ceiling effect. Thus, the result is uncertain, and being close to significance, it is unknown whether this factor would be significant if the factor was normally distributed.

For all other demographic variables, age, department, year of study, and travel frequency both before and after Covid-19, one-way ANOVAs were used to find whether there were differences in the scores on all six factors, however, no differences were found for either of the demographic variables on either of the factors. In addition, the assumption of variance was violated here as well, but as none of the demographic variables were close to significant and there were limitations, such as skewness, with these variables, this was examined no further. For some of the demographic variables, such as age, there were issues with very high skewness in answers, and some demographic variables, such as age, had very small groups which led to high variance within these groups. Thus, for other demographic variables, there were found no differences, but whether this is due to there being no differences, or a result of limitations within the data conducted in the current study, is hard to say. For the demographic variables without significant differences, meaning everyone except gender, no extra tables or figures are added in the current study to show these results.

Descriptive Analysis

The questions from the different categories were combined into factors for the main analyses, but first some specific questions were examined, to see the specific answers to these questions. As the factors are combined of multiple questions, they are supposed to show more general perception for the different categories, while these questions will show more specific answers. These questions were chosen as they are comparable to earlier findings, which will

give a general sense of the differences and similarities between the sample in the current study, and findings in earlier studies. In Table 2, the means for all questions can be seen, as well as the means for the factors. For getting a feeling of not just the means, but how many of the participants agree or disagree with the statements, “agree” and “strongly agree” are combined, “neutral” is by itself, and “disagree” and “strongly disagree” are combined. The questions looked at were ”coronavirus is just a new form of the flu” as this shows how serious the participants considered Covid-19 at the point of data collection. For this question 69 (29.5%) participants considered Covid-19 to just be a new form of the flu, 64 (27.4%) participants were neutral, while 101 (43.1%) participants considered Covid-19 to be something else than just a form of the flu. This shows that overall, the participants considered Covid-19, even towards the seeming end of the pandemic, to be more than just a flu. The question ”climate change is from natural causes only”, was studied, as this question shows how people attribute climate change. The results show that 6 (2.5%) of the participants attributed climate change to be from natural causes only, 12 (5.1%) were neutral, while 216 (92.3%) of the participants considered climate change to not just be from natural causes. This also is seen in the high mean score (Table 2), as this question had a mean at almost 5, which would be the highest score possible in the current study.

In addition to the questions for whether Covid-19 is a flu and attribution for climate change, two questions for Covid-19 and two questions for climate change related to travel behaviour were examined, one question each for behaviour change having occurred and one for whether the participants expected behaviour to change. For Covid-19 the questions were “My behaviour has already changed due to coronavirus”, where 64 (27.2%) participants reported not having changed their travel behaviour due to Covid-19, 45 (19.1%) participants being neutral, while 127 (53.8%) participants reported having changed their travel behaviour due to Covid-19. This shows that more than half the sample reported change in travel

behaviour due to Covid-19 while less than a third of the sample reported little or no change. For the question “my travel behaviour is likely to change due to coronavirus”, 103 (43.7%) participants did not expect future change in their travel behaviour, 56 (23.7%) were neutral, while 77 (32.6%) participants expected their travel behaviour to change due to Covid-19. Based on this, it seems most of the participants expects travel to go back to normal, while about a third expected change in travel behaviour to be changed, also in the future.

For climate change the question “My air travel behaviour has already changed due to climate change” 121 (51.3%) of the participants responded that their travel behaviour had not changed due to climate change, 44 (18.6%) participants were neutral, while 71 (30.1%) participants responded that their travel behaviour had already changed due to climate change. Over half the respondents thus reported no change in travel behaviour so far due to climate change while just under a third reporting already having changed their travel behaviour due to climate change. For the question “my air travel is likely to change due to climate change” 72 (30.5%) participants did not expect change to occur in their travel behaviour, 52 (22.0%) participants were neutral, while 112 (47.5%) participants did expect travel behaviour to change due to climate change.

Analyses of the factors The six factors rank from 1 to 5, where 1 shows low agreement with the statements, 3 is neutral, and 5 shows high agreement with the statements. The factors showed varying degrees of agreement, with four factors getting averages just below or exactly at 3 and two getting averages above 3. Perception for Covid-19 (M = 2.7, SD = 0.7) is below 3, meaning the mean for the participants is under neutral, and so the sample is not very worried about Covid-19. Perception for climate change (M = 4.0, SD = 0.7) is the highest ranking of the factors, where the mean shows that participants perceive risk for climate change. Travel risk perception for Covid-19 (M = 3.0, SD = 0.6) is at 3, meaning the

mean for the participants is neutral to the risk by air travel on the spread of Covid-19. Travel risk perception for climate change (M = 3.7, SD = 0.7) shows that participants do agree that there are risks from air travel on the climate. Travel behaviour for Covid-19 (M = 2.8, SD = 0.7) finds that the sample is quite neutral to change in travel behaviour for Covid-19, and slightly over to the side of disagreement, meaning on average the participants does not think travel behaviour has changed or will continue to stay changed due to Covid-19. Travel behaviour for climate change (M = 2.7, SD = 0.8) is also slightly under 3 meaning the sample are rather neutral, but slightly towards the side of no change. Overall, this means that for climate change the participants perceive high risk for climate change and perceive risk from air travel specifically, but despite this, the sample are neutral to change in behaviour. All three factors related to Covid-19 are very close to the middle, but slightly beneath, meaning people at the time of the survey were rather neutral both to perception, travel risk perception, and travel behaviour for Covid-19. However, none of the factors scored below 2.7, and so it seems that although people were quite neutral, none of the scores are far to the side of disagreement. The participants do then not perceive high risk, but neither do they perceive there to be no risk either for Covid-19, and as well as travel behaviour for both climate change and Covid-19.

A correlation matrix found positive correlations between all the different factors (Table 6), not just the ones that would be expected to correlate which would be all three factors for climate change and Covid-19 respectively, and possibly also the similar factors from each of the two categories. In line with this, the strongest correlations were observed between the factors that would be expected to correlate. Using a Pearson's r of .10 to.29 to indicate a small correlation, .30 to .49 to indicate moderate correlation and .50 to 1.0 to indicate a large correlation (Cohen, 1988, as cited in Pallant, 2016), there were found large to moderate correlations between the factors for climate change, low to moderate correlations

between the factors for Covid-19, and moderate correlations between the factors for perception, and the factors for travel behaviour. The rest of the correlations were low.

The large correlations were found between perception for climate change and travel risk perception for climate change, between travel risk perception for Covid-19 and travel behaviour for Covid-19, and between travel risk perception for climate change and travel behaviour for climate change. The factors with moderate correlation were between perception for Covid-19 and perception for climate change, perception for Covid-19 and travel risk perception for Covid-19, perception for climate change and travel behaviour for climate change, and travel behaviour for Covid-19 and travel behaviour for climate change. For all the other factors, including between risk perception and travel risk perception for Covid-19 even though they correlated significantly, this correlation was found to be low.

Two linear regressions were conducted, one for the three factors examining Covid-19 and one for the three factors examining climate change. For both linear regressions, travel behaviour was used as dependent variable, with perception and travel risk perception as covariates. Checking collinearity for both models, tolerance is sufficiently high with scores above .1 and VIF is sufficiently low with scores under 10 (Pallant, 2016) for both factors in the climate change model (*Tolerance* = .63, *VIF* = 1.58), and for both factors in the Covid-19 model (*Tolerance* = .91, *VIF* = 1.10). This indicates that the predictors in the models are not to highly correlated, which is not surprising based on the results of the correlation matrix. A Shapiro-Wilk test found that the residuals did not depart significantly from normality for Covid-19 (W = 0.99, p = .430) or for climate change (W = 0.99, p = .092), however for climate change the departing of the residuals is not far from significance, which may be related to the factor for perception for climate change, as this factor had a high ceiling effect. As it is still not significant, this is not very worrying, and so the assumption of normality in residuals are met for both Covid-19 and climate change.

Table 6. Correlation Matrix

		Perception for Covid-19		Perception for climate change		Travel risk perception for Covid-19		Travel risk perception for climate change		Travel behaviour for Covid-19		Travel behaviour for climate change
Perception for Covid-19	Pearson's r	—										
	p-value	—										
Perception for climate change	Pearson's r	0.405	***	—								
	p-value	< .001		—								
Travel risk perception for Covid-19	Pearson's r	0.300	***	0.164	*	—						
	p-value	< .001		0.013		—						
Travel risk perception for climate change	Pearson's r	0.265	***	0.607	***	0.211	**	—				
	p-value	< .001		< .001		0.001		—				
Travel behaviour for Covid-19	Pearson's r	0.275	***	0.200	**	0.511	***	0.296	***	—		
	p-value	< .001		0.002		< .001		< .001		—		
Travel behaviour for climate change	Pearson's r	0.191	**	0.411	***	0.243	***	0.637	***	0.445	***	—
	p-value	0.004		< .001		< .001		< .001		< .001		—

Table 6: Correlation matrix for all six factors.
Note. * p < .05, ** p < .01, *** p < .001

Cook's distance is low for both Covid-19 and climate change at well below 1 (Tabachnick and Fidell, 2013, as cited in Pallant, 2016), with Cook's distance ranging from 0.00 to 0.07 for climate change, and from 0.00 to 0.10 for Covid-19. This indicates that there are no outliers having an undue influence on the results. By examining the Q-Q plots for both Covid-19 and climate change it is found that the standardized residuals follow linearity closely (Figure 3.1-2). Based on the residual plots (Figure 4.1-8) the fitted plot as well as both covariates are fairly evenly spread. For the dependent variables, however, there is a clear tendency towards linearity but as this is only for the dependent variable, and all the other assumptions were met, it was decided to go on with the analyses.

For climate change, the overall model was significant, $R^2 = .41$, $F(2, 222) = 75.9$, $p < .001$. In the model, only travel risk perception for climate change was statistically significant $b = .72$, $t(222) = 9.27$, $p < .001$. Perception for climate change, however, when in a model together with travel risk perception for climate change added very little on its own to the model $b = .06$, $t(222) = 0.83$, $p = .405$. This means that in this model, examining perception and travel risk perception for climate change, together they explain 41% of the variance in the model, but almost all this variance could be explained by travel risk perception, while the explanation added by perception, was insignificant.

For Covid-19, the overall model was also significant, $R^2 = .27$, $F(2, 225) = 40.6$, $p < .001$. In this model both the covariates were significant, but here as well, perception for Covid-19, $b = .13$, $t(225) = 2.31$, p .022, was barely significant and explained far less of the model than travel risk perception for Covid-19, $b = .52$, $t(225) = 7.61$, $p < .001$. Together these two variables explained 27% of the variance in the model, and both perception of Covid-19 and travel risk perception for Covid-19 on their own added significant explanation to the model, even though here as well, travel risk perception seems to be the main contributor, while perception is far less significant.

As there was found a strong correlation between travel behaviour for climate change and for Covid-19, it was decided to see whether this would show in a regression analysis as well, and therefore two linear regression were conducted, one for climate change and one for Covid-19, but with travel behaviour for the other category added instead of perception. This gave interesting results, as for both climate change and Covid-19 the factor of travel behaviour for the other category was significant in a model together with travel risk perception for the same category as the dependent variable. The model with travel behaviour for climate change as the dependent variable was significant, $R^2 = .48$, $F(2, 225) = 102$, $p < .001$. Travel risk perception was still significant, $b = .66$, $t(225) = 10.94$, $p < .001$, and travel behaviour for Covid-19 was also significant, $b = .43$, $t(225) = 5.46$, $p < .001$. This shows that both these factors were significant in explaining variance in travel behaviour for climate change, and together explained 48% of this variance. With travel behaviour for Covid-19 as dependent variable, and travel behaviour for climate change and travel risk perception for Covid-19 the model was significant, $R^2 = .37$, $F(2, 225) = 65.8$, $p < .001$. Both travel risk perception, $b = .49$, $t(225) = 7.82$, $p < .001$, and travel behaviour for climate change, $b = .28$ $t(225) = 6.25$, $p < .001$, were significant in adding information to the model, and together they explained 37% of the model. This finding is somewhat unrelated to the hypotheses, as the two first are about risk perception and travel behaviour for Covid-19 and climate change separately, but as one of the objectives of the study was to understand the relationship between risk perception and travel behaviour for Covid-19 and climate change, it was decided to add this research, as it adds to this understanding.

Discussion

Comparisons with earlier findings

Climate change. Based on the question in the current study which asks whether the participants believe that climate change is from natural causes only, the results show that most of the participants do not attribute climate change to be solely from natural causes as just 2.5% of the sample attributed climate change to be from natural causes only. The findings in the current study differs from the findings of Hares et al. (2010) who found that many of their participants of UK tourists were unsure what climate change is and some were sceptic to whether it was taking place altogether. This is also below the findings of Poortinga et al. (2019) who found that 7.1% of Norwegians showed attribution scepticism, but the proportion of people who disagree or are neutral to the statement would be 7.6%, which is rather not far off from the findings of Poortinga et al. (2019). As the question in the current study is formulated using the word "only" to better catch the differences, some people may be in these two categories because they perceive climate change to be not *only* from human contribution. Thus, there is clearly a low attribution scepticism in the current sample, but exactly how low, is impossible to conclude from this question alone. As the sample in the current study is made up of students, and so only representative for a limited part of the Norwegian population, this may also add explanation to why the findings differ.

The findings in the current study are support the findings from Arnadottir et al. (2021), who found a high awareness of climate change, even though participants were unwilling to change their travel behaviour. There seems to be a strong awareness of climate change in the current sample, with perception having a mean score of 4.05, travel risk perception a mean score of 3.66, while travel behaviour had a score of 2.73 which suggests that the sample perceive a rather high risk for the climate, while, if not being unwilling, being rather neutral

to changes in travel behaviour for climate change. Arnadottir et al. (2021) found that even the most climate friendly participants were unwilling to change air travel behaviour, which does differ from the results of the current study, as a rather large amount of people in the current sample reported having already changed or expecting to change travel behaviour in the future. Expectations to change travel behaviour, however, does not correspond to the risk perception for climate change which is in line with the findings of Arnadottir et al. (2021). In the study by Arnadottir et al. (2021) the authors found that people were unwilling to completely avoid travelling abroad, but as the current study only asks for willingness and expectations to change, not to avoid air travel completely, the larger willingness reported in the current study may be a result of people being willing to change to a certain degree, but not completely.

The difference in scores between risk perception and travel behaviour in the current study may be a result of what Higham et al. (2014) called the "flyers dilemma" which describes the cognitive dissonance between the personal benefits of air travel, and the concern for climate change. The results of the currents study fits with this concept, as well as the findings of Cocolas et al. (2020) and Barr et al. (2010) who found an unwillingness to change travel behaviour. The results in the current study suggests a certain willingness to change travel behaviour, but this willingness to change is below travel risk perception for climate change, and so there is a dissonance in perception and behaviour.

Arnadottir et al. (2021) found no difference in climate awareness in the participants with stronger or weaker inclination to change travel behaviour, though they found that people who were more open to change, were less inclined to justify travelling abroad by shifting responsibility or lack of responsibility. This, they argue, may indicate that deeper knowledge of the impacts of air travel on climate change may change travel behaviour. The lack of difference in climate awareness for participants who were more or less inclined to travel in Arnadottir et al. (2021) study is similar to the findings in the current study, as the current

study found in a regression analysis, that even though there was a correlation between perception for climate change and travel behaviour, perception for climate change explained very little in a model together with travel risk perception. As travel risk perception for climate change in the current study was able to explain quite a bit of travel behaviour, also with perception for climate change in the model, this may support Arnadottir et al. (2021) argument that deeper knowledge of the impacts of air travel on climate change may influence travel behaviour rather than awareness or perception of climate change. Overall, both the qualitative findings of Arnadottir et al. (2021) and the quantitative findings of the current study seems to point towards travel risk perception for climate change being important for travel behaviour, while perception for climate change has a rather limited influence on travel behaviour.

The current study found that about a third of the participants reported having changed travel behaviour due to climate change, while almost half the sample responded that they expected to change, which is a bit in contrast with earlier findings that have found very low willingness to change (e.g. Arnadottir et al., 2021; Barr et al., 2011; Barr et al., 2010; Cocolas et al., 2020; Higham et al., 2014). As some of the mentioned studies asked for the willingness to completely quit air travel, while the current study only examine a willingness and expectation to change, this may be part of the reason. Otherwise, there may be many reasons why there are differences in reported willingness to change, such as age, with the current study having young age groups, gender, with the current study having a high percentage of women, demographic variables, such as the sample being students and Norwegians; or it may be a sign of changing times, with higher awareness and willingness to change, as other studies have found there to be a growing awareness of the risks posed by climate change (Venghaus et al., 2022). There is also the possibility that the differences in findings may be as result of Covid-19, as it showed many that change is possible.

Overall, it seems opinions are split when it comes to change, both for Covid-19 and for climate change. Whether people perceive change in travel to have happened for themselves, and whether they expect future change is does vary, but overall, there seem to be a fair amount of people on both sides, both reporting no or little change and reporting change. For Covid-19, people expect less change in their travel behaviour in the future, while for climate change people expect more change, though, only less than half of the participants expect their travel behaviour to change due to climate change.

Covid-19. For Covid-19 perception seemed to have not just a correlation with change in travel behaviour, but also, in contrast with climate change, to be significant in addition to travel risk perception in explaining travel behaviour. This supports the findings of Cahyanto et al. (2016), as they found worry, which is part of the perception factor in the current study, to be the strongest predictor for travel behaviour for Ebola as well as findings from studies that show the same for Covid-19 with risk perception, whether it be for travel or health, seemingly being a large factor when it comes to changing behaviour for pandemics (e.g. Chua et al., 2021; Lamb et al., 2021; Neuburger & Egger, 2020).

Differences for climate change and Covid-19. For four of the six factors the means for the participants were close to the middle, meaning the participants were neither on one side nor the other. For perception for climate change and travel risk perception the mean for the participants showed that they perceived high risk for climate change, as well as high risk specifically from travel. This shows that at the time the study was conducted, the participants were more worried and perceived high risk for climate change while being rather neutral for Covid-19, while reporting change in travel behaviour to about the same for both categories. These findings seems to support a cognitive dissonance between risk perception and travel behaviour for climate change, but not for Covid-19. Kallbekken and Sælen (2021) found

stronger support for limiting leisure travel for Covid-19 than for climate change, a difference they argued was influenced by the perceived duration of the different crises, and in line with this, more than half of the participants in the current study reported changes in travel behaviour having occurred due to Covid-19, while about a third expected to have continued changes in their behaviour. This is close to the opposite of climate change, where about a third reported changes in travel behaviour, while about half the sample expect future change. This suggests that people changed more for the seemingly short-term crisis of Covid-19 than the seemingly long-term crisis of climate change. This also seems to support the finding that Covid-19 is perceived to be more immediate and shorter lasting (Kallbekken & Sælen, 2021), as the sample expects less change for Covid-19 in the future than the past.

Hypotheses

The first and second hypotheses claimed that there would be a significant relationship between risk perception and travel behaviour for Covid-19, and for climate change. Based on the correlation matrix (Table 6), these hypotheses seem to be somewhat supported, with a moderate correlation between perception for Covid-19 and travel behaviour for Covid-19 and a large correlation between travel risk perception for Covid-19 and travel behaviour related to Covid-19. However, the correlation between perception for Covid-19 and travel risk perception for Covid-19 was low. For climate change the correlations between the factors were stronger, with large positive correlations between perception for climate change and travel risk perception for climate change; and between travel risk perception for climate change and travel behaviour for climate change; and a positive moderate correlation between perception for climate change and travel behaviour. Based on this, both the first and the second hypotheses are supported, however, the correlations between the climate change

factors are strong or moderate while the correlations between the Covid-19 factors are moderate or low.

In addition to these correlations between the factors related to Covid-19, and between the factors related to climate change, there were correlations across these two groups, suggesting the relationship between risk perception and travel behaviour is such that there is a tendency for risk perception, as well as a tendency for willingness to change. Perception for both Covid-19 and climate change had a moderate correlation; and travel behaviour for both Covid-19 and climate change had a moderate correlation as well. It seems then that in addition to the correlations between the factors related to Covid-19, and between the factors related to climate change, there is correlations between both factors related to perception, and both factors related to travel behaviour. For perception, this would fit with earlier findings as this include worry, and other studies have found that people that tend to worry, tend to do so more generally than just for one thing, and worry is considered to be a part of trait anxiety (Eysenck & Van Berkum, 1992). Based on this, it seems likely that the participants who worried about one crisis would also worry about another crisis. As this is part of the factor for perception, it can partly explain why these two factors correlate, but there may also be a tendency for perceiving higher risk, or for perceiving higher risk for crises. If so, more research would be needed to get an understanding of this possible relationship. For the two other questions of the factors, asking for attribution/seriousness and fearmongering, there was found no earlier studies suggesting that there is a common tendency, but for this correlation as well, more research could benefit the understanding of travel behaviour and what influences travel behaviour. The correlation between travel risk perception for Covid-19 and climate change, was low, indicating a weak relationship between these two factors. This may be a result of the differences between travel risks for the two crises.

Looking at studies for both epidemics and pandemics, and climate change, it is hard to find evidence of a relationship between people being willing to change behaviour for different crisis, or there being a group of people more willing to change. However, in this study there is a moderate relationship between the participants being willing to change behaviour for Covid-19 and the participants being willing to change behaviour for climate change, and this correlation is even just stronger than the correlation between the two factors for perception which is somewhat supported by the findings of Eysenck and Van Berkum (1992) that indicates worry is part of trait anxiety. In addition to the correlation, travel behaviour was added in regression analyses, so that travel behaviour was added as a covariate for the other category, meaning travel behaviour for Covid-19 was added in a model with travel behaviour for climate change as dependent variable, and for both climate change and Covid-19, the models were significant, with travel behaviour for the other category adding significant explanation to the model. Therefore, willingness to change may also be a general tendency or part of a trait rather than depending on the situation.

In addition to the correlations mentioned in this study, all the other factors had significant, but low correlations, indicating a certain relationship between every factor in the study. As all questions are related to ongoing crises, looking at the relationship between risk perception and air travel which has a clear relationship for both crises, it is not worrisome for the overall study that there were found low correlations, also between the seemingly unrelated factors.

The regression analysis showed that for both climate change and Covid-19, when combined in the same model, travel risk perception was a far stronger contributor to explain the variance in the model, than perception, and for climate change, perception for climate change added almost no explanation that travel risk perception for climate change did not explain on its own, with the added explanation not even being close to significance. As this

factor had a ceiling effect, this may have influenced the result, and thus, these results may have been affected by this. If the factor was normally distributed, without the ceiling effect, there is a chance it would significantly add explanation to this model, but to know this, further research will be needed. The results will be discussed further, but as this ceiling effect is present, that adds uncertainty to the results.

This finding that perception for climate change adds almost no explanation that travel risk perception cannot explain on its own, suggests that when it comes to changing air travel behaviour for climate change, perception on its own is not a strong predictor, instead, it is the perception of how high the risk of air travel is for the climate that makes people change behaviour. This finding is supported by earlier studies, that has found that even people that are worried, seems to be reluctant to change travel behaviour (e.g. Cocolas et al., 2020), while knowledge about the risk posed by air travel on the climate, has a much higher likelihood of leading to a change in behaviour (e.g. Arnadottir et al., 2021). For Covid-19 on the other hand, perception was found to add significantly to the model, which may indicate that perception is a bigger contributor to travel behaviour for Covid-19 than it is for climate change.

Both problems are associated with risk from air travel, but this risk is different, as the risk for Covid-19 is more immediate than the risk for climate change, as well as the risk from Covid-19 to a stronger degree being directly towards the individual, as the traveller may catch the disease, while the risks for climate change may feel more far away, as it is for the entire world rather than the individual. This may help explain why perception adds explanation for travel behaviour for Covid-19 but not for climate change, as Kallbekken and Sælen (2021) found that the perception of immediacy affect support for change in air travel for Covid-19 and climate change, as such that there is more support for change in air travel for Covid-19 than for climate change. This, the authors argue may be a result of higher perceived efficiency

from changes in travel behaviour for Covid-19 than for climate change. Changing behaviour for Covid-19 will directly affect the risks for Covid-19, while decreasing the risks of climate change is a collective effort, and thus, the disadvantages of avoiding air travel for Covid-19 may seem more worthwhile than the disadvantages of avoiding air travel for climate change.

For both the models, a big proportion of the variance was not explained by the covariates, as the covariates explained 41% of the variance for travel behaviour for climate change, and 27% of the variance for travel behaviour for Covid-19, meaning a big part of the variance in travel behaviour is not accounted for using these models with risk perception as covariates. As the intention with the linear regressions was to study the influence of perception and travel risk perception on travel behaviour, not to find all the possible variables leading to change, only the factors related to climate change and Covid-19 were used, not demographic variables. In addition, there may be a vast number of factors not studied here, such as personality or socio-economic status. For Covid-19, a likely variable influencing travel behaviour was restrictions that made it difficult to travel by air, especially internationally and thereby forcing individuals to change behaviour, rather than individuals making an active decision to change behaviour based on risk perception.

The two first hypotheses are supported, as there is a correlation between risk perception for Covid-19, both for perception and for travel risk perception, and travel behaviour; and between risk perception for climate change, both for perception and travel risk perception, and travel behaviour. However, risk perception is a stronger predictor for climate change than it is for Covid-19, as the correlation are higher, as well as the regression analyses finding a higher explanation by risk perception. For Covid-19 both factors for risk perception significantly contributed to the explanation of variance in travel behaviour, despite perception only having a low correlation with travel behaviour. For climate change, only one of the factors for risk perception, namely travel risk perception, had a significant contribution, while

perception added little extra explanation, despite having a moderate correlation with travel behaviour. Therefore, even though both the hypotheses were supported, it seems the way risk perception is related to travel behaviour is different for climate change and Covid-19.

The third hypothesis claimed that there would be differences in risk perception based on demographic variables. Earlier studies have found differences based on gender, usually with women perceiving higher risk for Covid-19 (e.g. Cahyanto et al., 2016; Neuburger & Egger, 2020) and being less sceptic to the trend of the climate changing (e.g. Poortinga et al., 2019) and being more willing to change for climate change (e.g. Hansmann & Binder, 2021); and age, with young people perceiving higher risk and being more willing to change for climate change (e.g. Hansmann & Binder, 2021), while travel risk perception decreases with age, which would mean younger people would experience higher travel risk (Neuburger & Egger, 2020).

For gender all factors had higher mean scores for women than, men, however, three were not significant. The significant findings show that women perceive higher travel risk perception related to climate change, as well as higher expectations to change travel behaviour for both climate change and Covid-19. Overall, the finding in this survey seems to agree with earlier studies, as the current study found women to perceive higher travel risk for climate, as well as being more willing to change behaviour both for climate change and Covid-19. For perception for both categories, as well as travel risk perception for Covid-19, the differences between women and men were insignificant both for Covid-19 and climate change.

As four of the factors found significant differences in the variance between men and women, here with men always having higher variance than women, it may seem that another difference found in this study, is a tendency for more variation in men’s answers than in women’s answers. Based on a study by Lippa (2010) it seems that different variability

between genders is found for traits, with women having higher variability than men for some traits, and vice versa for other traits. Thus, it seems men do not have a tendency to vary more for all things, and whether there is a tendency for men to vary more for climate change and Covid-19 as the findings in the current study suggests, or for crises in general or for risk perception or change in behaviour as would also be a possibility, will need more research.

Age has, as mentioned, also been found to have an influence on perception as well as behaviour (e.g. Hansmann & Binder, 2021), but the current study found no significant difference between the different age groups. The sample were students, which may be the reason, as the sample has a very low age range, as well as low mean age, and very few participants in the older age groups. In addition to this, neither department, year of study nor travel frequency were found to be related to either perception, travel risk perception or travel behaviour for either climate change or Covid-19. Thus, the third hypothesis was partly supported, finding differences based on gender.

Conclusions

Air travel has through the last decades turned into a massive industry with the expectation of continued growth going forward. This has some serious effects on the environment, as air travel is one of the largest contributors to climate change, as well as the globalization leading to the possibility of rapid spread of new diseases, such as the Covid-19 pandemic. Previous studies have found risk perception to be relevant for travel behaviour both for climate change, and Covid- 19 and earlier epidemics, but few studies have looked at both two crises together. As the Covid-19 pandemic was still ongoing at the date of data collection, this gave a perfect opportunity to study both these crises, and so, the current study was interested in how risk perception for climate change and for Covid-19 influences air travel behaviour, as well as demographic differences for risk perception and travel behaviour.

The only demographic variable that had a significant effect on risk perception and travel behaviour, was gender, where women were found to perceive higher travel risk perception for climate change, as well as reporting higher change in travel behaviour than men. For perception, and travel risk perception for Covid-19, the difference between men and women was not significant. No other differences were found between other demographic factors, but this may be a result of the sample being students.

The results suggest that people worry for climate change, as well as attribute climate change to not be solely from natural causes and overall perceive high risk for climate change, as well as perceiving air travel to be a risk for the climate; while being rather neutral both to perception for Covid-19, travel risk perception for Covid-19, as well as travel behaviour both for climate change and Covid-19. Both perception and travel risk perception were correlated to travel behaviour for both climate change and Covid-19, however, the correlations for climate change are stronger than the correlations for Covid-19, and for Covid-19 the correlations were low or moderate. In a linear regression both perception and travel risk perception help explain travel behaviour for Covid-19 despite the low or moderate correlations. For climate change, only travel risk perception adds explanation to travel behaviour, while perception barely explains anything that travel risk perception cannot explain on its own. Thus, it seems that for climate change, even though it is a moderate correlation between perception and travel behaviour, perception does not add explanation to travel behaviour that travel risk perception cannot explain on its own. For climate change it seems that perception on its own does not explain travel behaviour, while perceiving air travel to be a risk for the climate has a significant explanation for travel behaviour. This may indicate that knowledge about the risks is more important for travel behaviour, than just perceiving high risk.

For Covid-19 on the other hand, though risk perception overall explained less when it came to travel behaviour than travel risk perception, both risk perception factors significantly contributed to explaining travel behaviour, though here as well, travel risk perception had a higher contribution than perception had. For both factors, travel risk perception has a significant explanation on travel behaviour, but most of the variance in the travel behaviour factor is not explained by perception and travel risk perception, meaning there are other variables, such as demographic variables or personality traits, that is needed for a full model that can explain change in travel behaviour for both climate change and Covid-19.

Limitations and Future Directions

One limitation with the current study is that the study was conducted on students, and as such, the results will not be generalizable to the whole population. Another limitation is that the factor examining risk perception for climate change had a ceiling effect as almost all participants scored high for perception of climate change, and the survey was not able to detect the differences between participants with the highest scores on this factor. This is relevant for future studies, surveys that are more sensitive to the differences in high scores for risk perception for climate change, may get more normally distributed results.

The current study was conducted after what will hopefully be the most serious part of the Covid-19 pandemic and the findings will be affected by this. To get a more complete understanding of the relationship between risk perception and travel behaviour it would have been ideal to start at the beginning of the pandemic and test over time if there would be changes. In addition to this, the issues experienced with collecting data lead to a delay in the data collection and lost participants. As the situation was changing rapidly at that time, this may have resulted in bigger differences in answers for participants based on time of participation.

As pandemics come rapidly, an idea for future research may be to prepare for possible studies on pandemics before the pandemics occur. As we have gotten some experience with pandemics over the last couple of years, examining the lost opportunities for science during this pandemic, may give better opportunities for studying future pandemics.

As longer studies will be harder to get participants to complete, the survey used was deliberately kept short, and so there were a lot of interesting themes not studied. Also, the quantitative nature of the study makes it difficult to get a deeper understanding of why participants answered the way they did. Therefore, there are limitations to what the current study can add to the understanding of risk perception, climate change, Covid-19, and travel behaviour. For a more comprehensive understanding, more research is needed showing different aspects of these themes.

As this study was conducted within a short window of opportunity, it will be hard to replicate the findings, conduct similar research, or find research than can give support or question the findings in the current study. Some findings in this study that would be interesting to expand on, are the finding that there seems to be similarities between people who perceive risk for both Covid-19 and climate change as well as between people reporting change for travel behaviour for these two crises. Further research conducted on this issue could potentially find different subgroups of people who react differently in the face of crises. Further research could also be conducted on the differences in risk perception for different crises, as the results of the current study suggest that risk perception and travel risk perception have different relevance for Covid-19 and climate change, which may further suggest that risk perception vary based on the conditions of different crises, and the relationship between risk perception and travel behaviour also varies based on these conditions. Altogether, this study has added to the understanding of the relationship between risk perception and travel

behaviour and further research can build on the findings and further broaden our understanding of risk perception, crises, and behaviour.

Figures

Figure 1.1-6. Normality for the variables

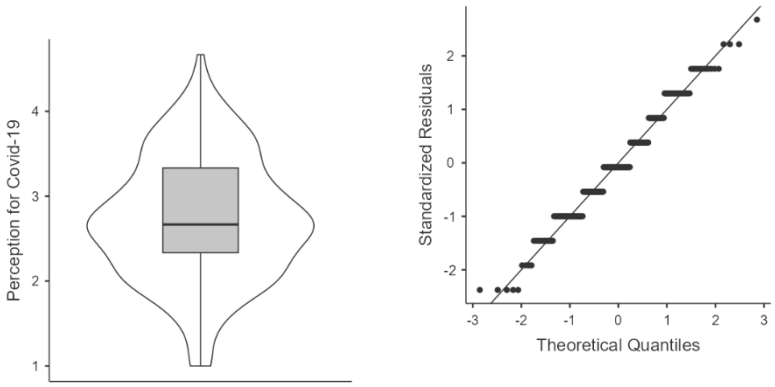

Figure 1.1: Box-plot with violin plot and Q-Q plot for "perception for Covid-19".

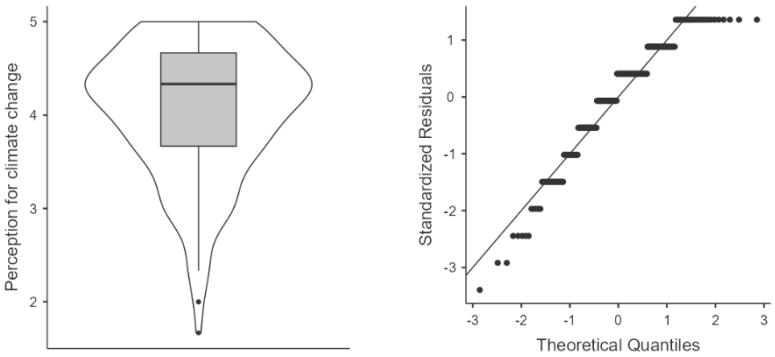

Figure 1.2: Box-plot with violin plot and Q-Q plot for "perception for climate change".

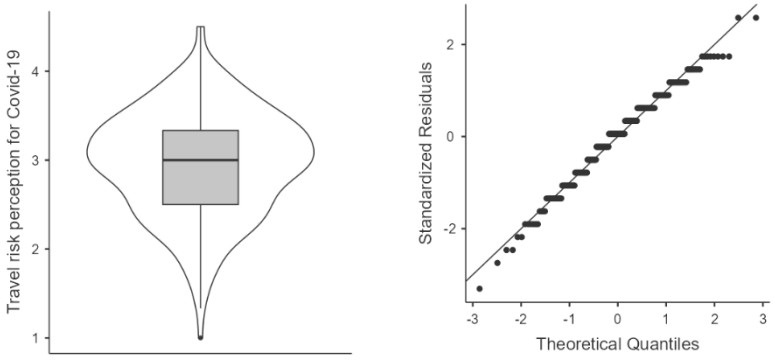

Figure 1.3: Box-plot with violin plot and Q-Q plot for "travel risk perception for Covid-19".

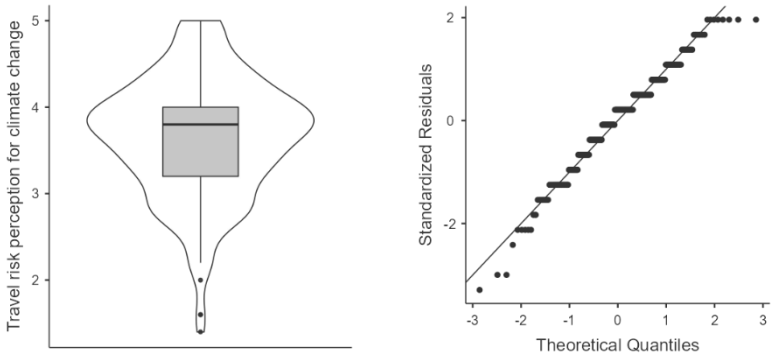

Figure 1.4: Box-plot with violin plot and Q-Q plot for "travel risk perception for climate change".

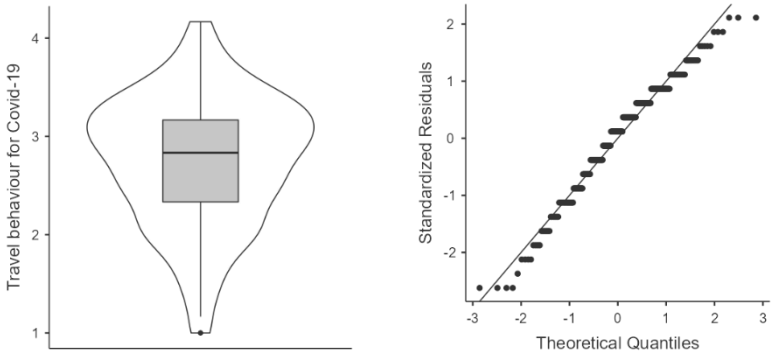

Figure 1.5: Box-plot with violin plot and Q-Q plot for "travel behaviour for Covid-19".

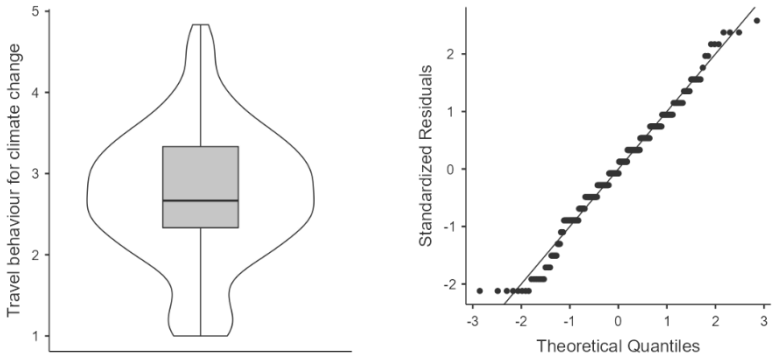

Figure 1.6: Box-plot with violin plot and Q-Q plot for "travel behaviour for climate change".

Figure 2.1-6. Q-Q plots for t-tests for gender

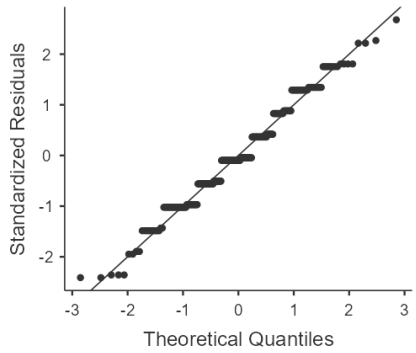

Figure 2.1: Q-Q plot for t-test on perception for Covid-19, with gender as grouping variable.

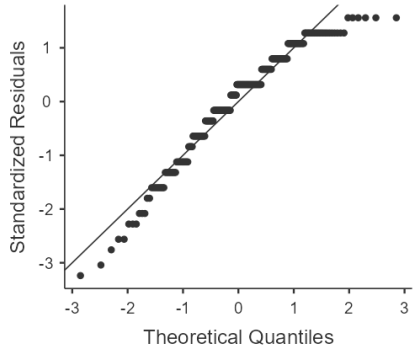

Figure 2.2: Q-Q plot for t-test on perception for climate change, with gender as grouping variable.

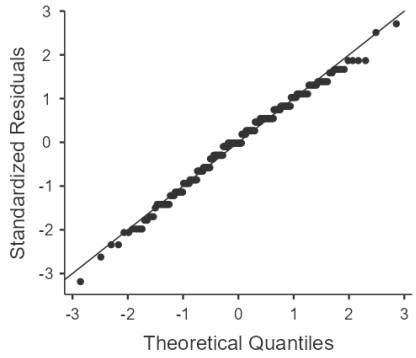

Figure 2.3: Q-Q plot for t-test on travel risk perception for Covid-19, with gender as grouping variable.

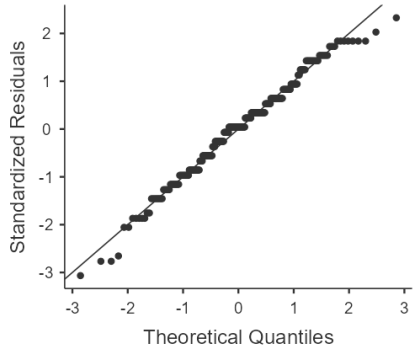

Figure 2.4: Q-Q plot for t-test on travel risk perception for climate change, with gender as grouping variable.

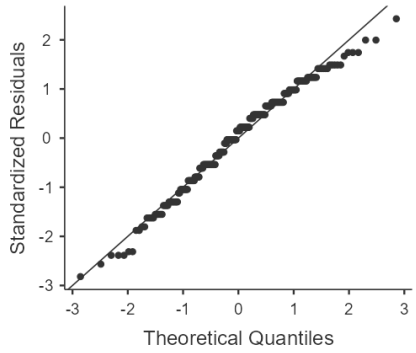

Figure 2.5: Q-Q plot for t-test on travel behaviour for Covid-19, with gender as grouping variable.

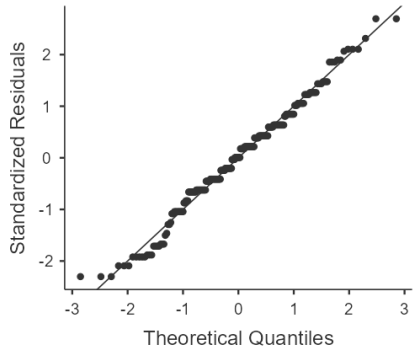

Figure 2.6: Q-Q plot for t-test on travel behaviour for climate change, with gender as grouping variable.

Figure 3.1-2. Q-Q plots for regression analyses

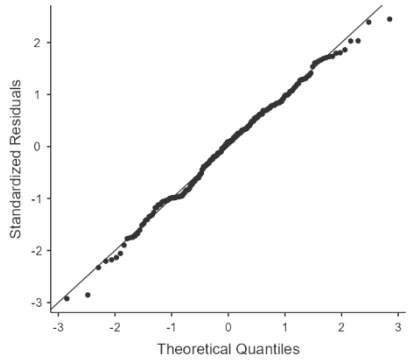

Figure 3.1: Q-Q plot for residuals in regression analysis for Covid-19

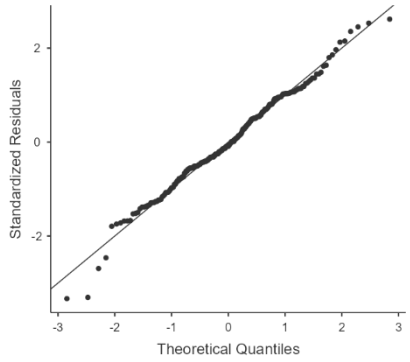

Figure 3.2: Q-Q plot for residuals in regression analysis for climate change

Figure 4.1-8. Residual plots for regression analyses

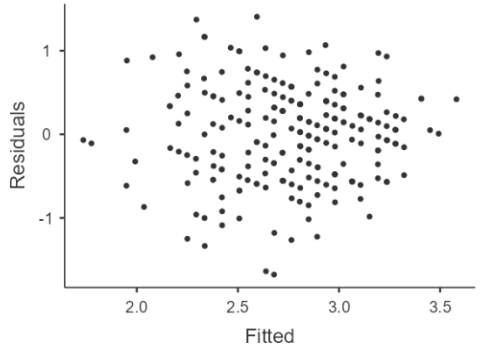

Figure 4.1: Fitted residual plot for regression analysis for Covid-19 in regression analysis

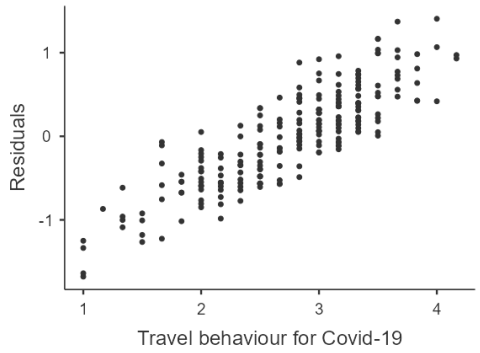

Figure 4.2: Residual plot for travel behaviour for Covid-19 in regression analysis

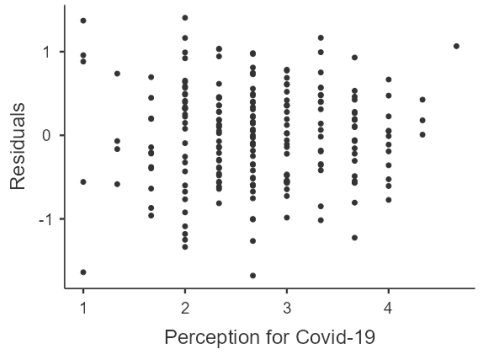

Figure 4.3: Residual plot for perception for Covid-19 in regression analysis

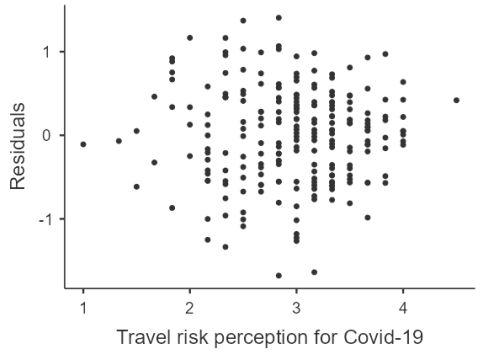

Figure 4.4: Residual plot for travel risk perception for Covid-19 in regression analysis

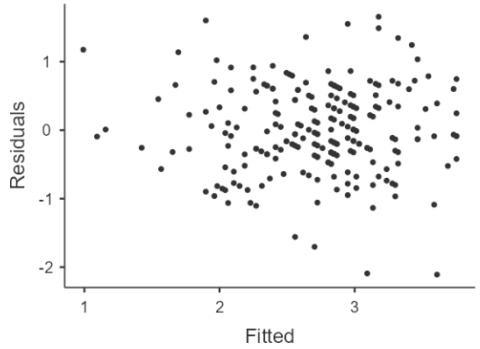

Figure: 4.5: Fitted residual plot for regression analysis in climate change

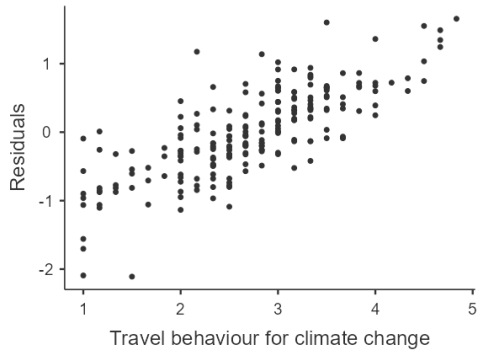

Figure 4.6: Residual plot for travel behaviour for climate change in regression analysis

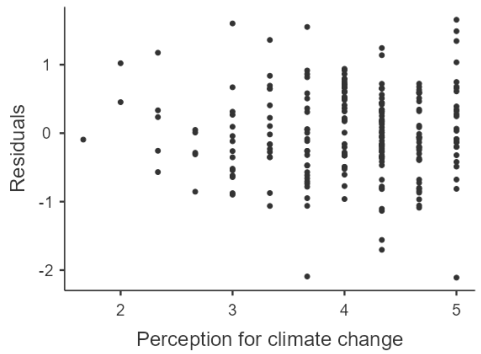

Figure 4.7: Residual plot for perception for climate change in regression analysis

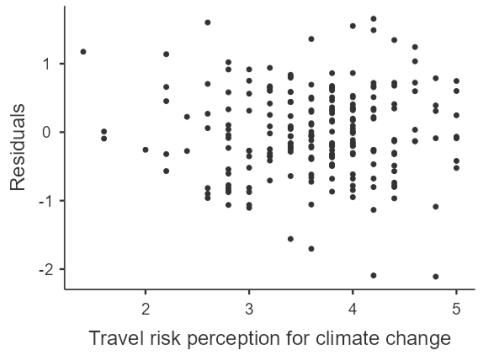

Figure 4.8: Residual plot for travel risk perception for climate change in regression analysis

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