

Predictors of climate change risk perceptions among Finns

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<p>Uppmärksamhet har ökat kring riskuppfattningar av klimatförändring bland sociala vetenskapare. Tidigare forskning antyder att risk perceptioner kring klimatförändring har ökat både i Finland och internationellt, men det har också skepticism över klimatförändring. Determinanter har identifierats i litteraturen, klassificerade i fyra tematiskt distinkta dimensioner av van der Linden (2015) som inkluderar: socio-demografiska, socio-kulturella, kognitiva och erfarenhetsbaserade faktorer, vilka påverkar riskuppfattningar om klimatförändring i varierande grad. Målet med denna avhandling var att utvärdera om och hur mycket ett urval av sociokulturella (värderingar och politisk inriktning) och sociodemografiska faktorer (ålder, kön, akademisk utbildning) förutspår klimatoro bland finländare.</p> <p>Uppgifterna för denna studie hämtades från European Social Survey från 2016, som erbjuder ett representativt urval av finländare (N = 1925). Pearsons korrelationskoefficienter erhöles för att avslöja bivariata förhållanden mellan variablerna, följt av två linjära regressionsanalyser för att bedöma deras kombinerade effekt på klimatförändrings-riskuppfattningar. Resultaten stödde befintlig litteratur. Arbetet fann att sociokulturella faktorer är mer förutsägbara än socio-demografiska. Effekten av politisk inriktning och universalism var måttlig, medan effekten av ålder, kön och akademisk utbildning var svag.</p> <p>Resultaten visar att universalism och i synnerhet politisk inriktning förutspår risk uppfattningar om klimatförändring. Framtida forskning bör fortsätta att studera effekterna av socialpsykologiska faktorer, eftersom det finns indikationer av att de påverkar klimatförändrings-riskuppfattning i växande grad, medan effekterna av intuitivt tilltalande faktorer som ålder, kön och utbildning krymper.</p>			
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1 Introduction

According to the UN Climate Panel (IPCC, 2018) climate change is real and man-made. It poses a threat to humanity, in that carbon dioxide and other greenhouse gasses cause a rise in global temperatures (IPCC, 2018). According to Mora, Spirandelli and Franklin (2018) it is urgent to deal with climate change, because if global warming keeps increasing at the current rate, within years 2030-2052 it is assessed to come to 1.5°C above pre-industrial levels. Uncontrolled emissions of greenhouse gasses are setting off multiple threats, such as sea-level rise, hurricanes, fires, droughts, and floods, according to Mora et al. (2018). Additionally, such hazards triggered by climate change threaten to impact health, food, water, economy, infrastructure and security of humanity on a global scale, unless drastic counter-action is taken swiftly (Mora et al., 2018).

Nordhaus (2018), Rosling, Rosling & Rönnlund (2019) and Lomborg (2020) acknowledge climate change as real and man-made with dire consequences if not mitigated. However, it is suggested that there are commonly held fallacious perceptions about climate change, which are not data-driven, but rather based on fear and biased intuition that may end up doing more harm to humanity if implemented. One such misconception, according to Lomborg (2020), is a commonly held belief that climate change is certainly causing more extreme weather events, and that they are more devastating than ever. Citing the IPCC (2018), Lomborg (2020) notes that global death risk from extreme weather has declined by 99% over the last 100 years, and global costs from extreme weather events have receded by 26% in the last 28 years. In addition, the UN Climate Panel has not found conclusive evidence for a global increase in floods, droughts or hurricanes (Lomborg, 2020). Nonetheless, perceptions that extreme weather events are occurring more frequently and with more devastating power than ever are wide-spread among the public, which is a form of climate alarmism that is potentially more harmful than helpful in the effort to solve the climate crisis (Rosling et al., 2019; Lomborg, 2020).

Nordhaus (2018) and Lomborg (2020) suggest that even if drastic societal changes were undertaken to cut emissions, it would only have a miniscule effect on slowing down the rate of climate change. In addition, collateral damage from such an undertaking would likely drastically

stifle economic growth globally, which in turn would leave humanity suboptimally equipped to mitigate climate change in the long term (Nordhaus, 2018; Lomborg, 2020). A more gradual climate change mitigation is suggested, one that does not sacrifice economic growth through drastic emission cuts (Nordhaus, 2018; Lomborg, 2020). However, Schwartz (2020) has questioned the conclusions reached by Nordhaus (2018) and Lomborg (2020). It is suggested that climate change needs to be dealt with urgently, and that concerns over economic setbacks are based on erroneous interpretations of data. A concern over the effect of scholarly scepticism of climate change mitigation is noted, in that it may embolden broader scepticism about the realness of climate change in general among the public, and/or questioning the utility of climate change mitigation (Schwartz, 2020).

Nonetheless, as some climate experts such as Nordhaus (2018), Rosling et al. (2019) and Lomborg (2020) do display a degree of scepticism, based on conclusions drawn by IPCC (2018), it seems unreasonable and biased to presume that climate change belief and concern is absolutely grounded in fact, while scepticism is absolutely unfounded. It seems useful to examine the phenomenon of climate change risk perception as ranging on a scale. As it pertains to scepticism there is a range from denial of the fact that man-made climate change is real, to scepticism of drastic change climate policy proposals' efficacy and cost/benefit ratio. A range of climate concerns also exists; from beliefs and concerns that are based on statistically significant empirical evidence, and beliefs and concerns that are based on biased intuition and fear (Rosling et al., 2019; Lomborg, 2020).

Note that climate change risk perceptions and climate concern will be used interchangeably in the present paper. Social scientists such as Capstick, Whitmarsh, Poortinga, Pidgeon and Upham (2015) have done a meta-analysis of public risk perceptions of climate change over time, suggesting that awareness of man-made climate change, as well as concern of it, has been on the rise globally since the 1980s. However, the extent to which climate change is perceived as a serious threat for humanity fluctuates across cultures, nations and there is great variance within countries as well (Capstick et al., 2015). Scepticism toward climate change among the public is also on the rise, concurrently with a rise in climate concern, according to the authors. Noteworthy

is that the scepticism measured pertains to whether one believes in man-made climate change and how concerned one is about its effects (Capstick et al., 2015). It is not to be confused with scepticism of specific mitigation policies' efficacy and cost/benefit ratio (e.g. Nordhaus, 2018; Lomborg, 2020).

Social psychological research on climate change risk perceptions has been especially keen on increasing understanding of individual level factors that predict climate change risk perceptions, and to what degree they exert predictive power (Hornsey, Harris, Bain and Fielding, 2016). Hornsey et al. (2016) suggest that political orientation and certain broad value orientations can be stronger predictors of climate concern than intuitively appealing variables such as education, or knowledge of threats associated with unmitigated climate change. However, Knight (2016) has found that awareness of climate change is greater in societies that are more highly educated and wealthier, and that awareness is not affected significantly by political orientation. There are many contradictory findings like this in the literature, which suggest that climate change risk perception is a multifaceted and complex issue without a simple, univariate explanation.

Predictors of risk perception can be clustered into four distinct groupings, according to van der Linden (2015). These include socio-cultural, experiential, cognitive and socio-demographic factors, that together explain most of the total variance in climate change risk perception. Surprisingly little quantitative research has been conducted exploring the role of social factors that predict individual risk perception (van der Linden, 2015), thus necessitating further inquiry into their predictive power. Van der Linden (2015) has developed a theoretical model named the Climate Change Risk Perception Model (CCRPM), which claims to be able to explain a remarkable amount, almost 70%, of the total variance in climate change risk perception.

While the present study on predictors of climate change risk perceptions will not investigate the whole model, the CCRPM will be used as its theoretical framework, and the research questions of the present study are derived from it. The aim of the present study is to investigate the predictive power of socio-demographic variables; age, gender and academic education, and

socio-cultural factors; political orientation and values on climate change risk perception, in hopes of contributing to the growing understanding of factors that influence climate change risk perception among Finns.

2 Prior research and theoretical framework

The chapter begins with an overview of what is known about climate change risk perceptions by looking at past research findings, beginning with how risk perceptions have changed throughout time. Then follows a presentation of key cognitive, experiential, socio-cultural and socio-demographic factors that have been identified as significant predictors of climate change risk perceptions in previous research.

2.1 A timeline of climate change risk perceptions

According to Lee, Markowitz, Howe, Ko and Leiserowitz (2015) risk perceptions of climate concern vary internationally. A global majority believe in the reality and human impact of climate change and that climate concern has emerged gradually, beginning from the 1980s and early 1990s (Lee et al, 2015; Capstick et al., 2015). In one of the earliest surveys ever conducted to examine climate change attitudes from 1982, almost half of U.S. respondents perceived climate change as either a very, or somewhat serious threat, according to Capstick et al. (2015). Subsequent opinion polls showed that by the end of the eighties three quarters of the U.S. population reported some level of concern (Capstick et al., 2015).

According to Brechin (2003), a 1992 global survey conducted among 24 countries showed that roughly half of all respondents perceived climate change a ‘very serious’ problem, indicating growing, wide-spread concern. However, looking at the national level, substantial variability was found between countries. Whereas 73% of Germans and 72% of Portuguese perceive climate change as a ‘very serious’ hazard, only 34% of Finns and 26% of Nigerians rated the issue as similarly disconcerting (Brechin, 2003). Public concern kept increasing on a global scale during the 2000s, according to Capstick et al. (2015). Stronger public support for policies to mitigate a climate change crisis also began to emerge. Acknowledgement that human activities are causally linked to the climate change crisis became more wide-spread, as well as growing support for policies aimed at reducing emissions (Capstick et al., 2015).

Capstick et al. (2015) suggest that from the late 2000s, the pattern of gradual growth in climate concern began to change. Scepticism among the public about climate change began to grow alongside growing awareness of the climate crisis, despite alarmist media coverage ramping up

from 2006 onward. The decrease in public concern can be at least in part attributed to issue fatigue, the global finance crisis of the late 2000s, growing distrust of authorities and the growing politicization of climate change, according to Poortinga, Whitmarsh, Steg, Böhm and Fisher (2019).

Driscoll (2019) suggests that politicization of climate change has played a significant role in deepening the scepticism associated with climate change in the U.S. To this point, there was a marked change in how climate change was perceived in the United States following the election of Obama for President in 2008 (Driscoll, 2019). Climate change then suddenly became a way for hard-line Republicans to differentiate from Democrats and their policy positions concerning climate change and spending costs (Driscoll, 2019).

According to Milfont, Wilson and Sibley (2017) there is not a clear understanding in the literature of how much climate concern fluctuates over time. The common usage of public opinion polls do, however, give some indication that climate change risk perception varies globally and that it changes over time (Milfont et al., 2017). Although trends point to growing scepticism about climate change on an international scale, Lee et al. (2015) suggest that there were significant differences between nations during the late 2000s and early 2010s. In some countries there was a significant hike in concern, while in others the concern drastically dipped. Global differences in risk perception are complicated, multifaceted and as of yet, poorly understood, according to Lee et al. (2015).

It is noteworthy that large parts of the English-speaking world (North America, Australia and parts of Europe) tend to report higher increases in scepticism than other regions (Lee et al., 2015). Other areas, such as Sub-Saharan Africa and parts of Asia have had a different developmental trajectory; one in which climate concern has tended to increase steadily over time (Lee et al., 2015). This acts as a useful reminder that growing climate change scepticism among the public is more descriptive of Western tendencies and may not be universally generalizable. However, considering the suggestion by Knight (2016) that climate scepticism is linked with wealth, the non-Western nations that are quickly transforming into economic powerhouses

(Rosling et al., 2019) may also begin to display similar patterns of increased climate change scepticism, as aggressive mitigation efforts to cut emissions drastically may threaten economic growth in developing countries. Some scholars (Nordhaus, 2018; Lomborg, 2020) argue that sacrificing economic growth for drastic emission cuts would hamper societies ability to combat climate change long term, as less economic resources mean there would be less money to invest in research and development of technology that could make decarbonization of society more affordable and effective. This point of view is contested by some scholars, for instance by Schwartz (2020), who claims that the conclusions reached by Nordhaus (2018) and Lomborg (2020) are erroneous, economic concerns overblown, and that drastic emission cuts are necessary to avoid catastrophe.

2.2 Predictors of climate change risk perceptions

In the following is a brief overview of the literature assessing predictors of climate change risk perceptions. They are categorized in accordance with the CCRPM (van der Linden, 2015) starting with the cognitive component, followed by experiential factors, socio-demographics and finishing with socio-cultural factors.

2.2.1 Cognition

Sundblad, Biel and Gärling (2007) suggest that cognitive and affective risk judgements relate to climate change and that there is a complex interaction between affect and cognition. Van der Linden (2015) suggests that the degree to which a cognitive understanding of climate change can predict risk perceptions remains relatively unknown. Conceptual confusion about cognition is caused by the often overlooked difference between ‘subjective’ knowledge (i.e. what people perceive to be true) and the actual ‘evidence’ (climate experts’ findings), according to van der Linden (2015). The distinction of objective knowledge from subjective has not received much attention in previous research (van der Linden, 2015), and it is argued that this heavily contributes to the poorly understood link between cognition and risk perception. Studies that use single-item measures to evaluate subjective, self-reported knowledge, such as ‘I know a lot about climate change’, tend to report inconsistent results, which run into replication issues, among other problems with evaluation (van der Linden, 2015).

Van der Linden (2015) suggests that objective knowledge is subservient to social factors in risk perception of climate change, such as the influence of political orientation. Malka, Krosnick and Langer (2009) found that knowledge about climate change is positively correlated with climate concern for people that lean toward liberalism, while people who lean toward conservatism do not tend to show a similarly strong link between increased knowledge and increased climate concern. Because of the complexity of cognition and the issues in operationalizing and evaluating it, the cognitive component of the CCRPM will not be assessed in the present study. However, it is arguably partly and indirectly captured by academic education, which *is* measured in the present study.

2.2.2 Experience

Sjöberg (2006) suggests that the importance of affect in forming risk perceptions is insignificant. However, more recent research by and large supports the view that emotions are powerful predictors (Lehman, Thompson, Davis and Carlson, 2019). Van Eck, Mulder and van der Linden (2020) suggest that experiential processes are the most powerful predictors of the total variance in risk perception, with emotions exerting the most power.

Public opinion on climate change tends to be founded on emotion rather than on scientific evidence, according to Lehman et al. (2019). Furthermore, risk perception of climate change can be altered with exposure to affective imagery (Lehman et al., 2019). Pictures of melting glaciers, pictures of a polar bear floating on an ice block and the aftermath of a natural disaster tends to evoke strong emotions that heighten the risk perception of climate concern (Lehman et al., 2019).

Another similar affective imagery study by Chapman, Howden-Chapman & Capon (2016) found that pictures which exemplify solutions to climate change yield positive emotional reactions, and were less polarizing and more palatable for climate change sceptics. They did, however, not motivate pro-environmental action. Well-known climate change images (such as a polar bear floating on an ice block) were readily understood, and were consequently assessed with positive emotion. However, such pictures were also viewed with scepticism, in part for being deemed a tired old cliché that is meant to evoke a certain response. Thus exemplifying the complexity of the role of emotions in risk perception and how they interact with other factors, such as cognitive assessments.

Perceived personal experience with the detrimental effects of climate change, such as extreme weather events, can reshape climate change risk perceptions. Interestingly, findings by Rosling et al. (2019) and Lomborg (2020) suggest that extreme weather events have not increased, nor have their impact on humanity worsened as a result of man-made climate change. This suggests that having lived experiences of extreme weather events can lead to unsubstantiated attribution of such experiences to climate change, even though such linkage is not necessarily supported by empirically verifiable data. However, Schwartz (2020) has criticized such conclusions, claiming that Lomborg (2020) is misinterpreting climate data by IPCC (2018) and reaching inaccurate conclusions.

Wang and Kim (2018) found that direct experience of weather conditions such as drought and extreme heat were accurate predictors of climate change belief and concern. For example, residents of regions that were affected by the severe drought that covered much of the western United States between 2005 and 2016 refer to the drought as the primary reason for their belief in and concern about climate change. However, causality could not be determined as it remains unclear whether the weather conditions were actually changing risk perceptions of climate change, or if pre-existing beliefs or intuitions are causing people to rationalize the extreme weather events they have experienced in a manner that is consistent with those beliefs (Wang and Kim, 2018).

Carlton, Mase, Knutson, Lemos, Haigh, Todey and Prokopy (2016) noted, however, that only incremental changes in climate concern were observed before and after the severe drought of 2012 in the Midwestern United States. Such inconsistencies suggest that there may be other factors, such as political orientation, that may dampen concern in areas populated mostly by conservatively leaning folk, which would be in line with Driscoll's (2019) assertion that political orientation may be a better predictor of climate change risk perception.

2.2.3 Socio-demographics

According to Poortinga et al. (2019), individual-level factors in risk perception of climate change has been the focus of many studies on climate change, but according to Driscoll (2019) the

predictive power of socio-demographic factors has diminished in recent decades. In the following the effect of gender, age and academic education will be examined by looking at findings from previous research.

Previous research on gender differences in risk perception suggest that men tend to be more sceptical of climate change than women (Gustafson, 1998). Van Eck et al. (2020) found that gender is a strong predictor of climate concern, suggesting that the trend has held. Flynn, Slovic and Mertz (1994) found that there are differences in risk perception among white women and white men, with white men showing considerably less concern and more acceptance of risk. Such stark gender differences were not found with non-white men and non-white women. Finucane, Slovik, Flynn and Satterfield (2000) also note a link between race and gender and use the term ‘white male effect’ to describe the phenomenon. They posit that the effect of race and gender on risk perception has a socio-political component. The findings suggest that socio-political factors, such as power are strong determinants of risk perception and acceptance of risks (Finucane et al., 2000), presuming that whiteness and maleness are associated with power and dominance, especially when they intersect. Laws, Yeh, Reisner, Stone, Wang and Brugge (2015) found that even though white respondents, and particularly white men, were less concerned about air pollution than others, which could serve as proof of the ‘white male’ effect, this effect vanished when controlling for distance from the highway. Laws et al. (2015) suggest that the effect found in previous research may in part be explained by the greater probability that minority respondents live close to polluted areas, thus implying that other factors than race and gender are exerting influence. The present work evaluates whether gender is related to climate change risk perceptions among Finns.

Previous research into age effects suggest that age is not a strong predictor of climate change risk perception (van Eck et al., 2020). Van der Linden (2015) posits that there is a common assumption that older people are less risk seeking than younger people. This may, however, be an oversimplification that leads to misconceptions about the effects of age. According to van der Linden (2015), some studies have indicated that age correlates positively with risk aversion. Other studies, such as Kellstedt, Zahran and Vedlitz (2008) have claimed the opposite, or found no differences (van Eck et al., 2020).

According to van der Linden (2015) age differences in climate change risk perception may vary across risk domains, and so certain domains produce more of an effect of age than do other domains. Higher age tends to be linked to perception of risk in behaviours pertaining to the domains of health, and less risk in the social domain, while the opposite may be true with lower age (van der Linden, 2015). The findings suggest that differences of age in risk preferences may have variability across different value domains, but as it pertains to age and climate concern, previous research suggests that the effect of age is insignificant (van Eck et al., 2020). The present study examines whether age is related to climate change risk perceptions among Finns.

Levels of awareness, knowledge and comprehension of climate change have broadly increased throughout the decades (Capstick et al., 2015). Knight (2016) attributes such development in part to educational institutions' increased efforts to inform the public about the hazards of unmitigated climate change, and inferring that a lack of formal education is linked to lower levels of climate concern by the same logic. Hornsey et al. (2016) suggests that formal education and higher income yields an added sense of control and power, therefore lowering risk perceptions.

In line with this, Capstick et al. (2015) point out that belief in the threat of man-made climate change was no higher in 2009 than it had been in 1992, despite increased education and awareness across the board. This suggests that other factors may play important parts in undermining information processing through education and feeding what Driscoll (2019) calls the growing 'denial-counter movement'. Drummond and Fischhoff (2017) found that individuals with greater science literacy and education have more polarized beliefs on controversial science topics, suggesting that education has an ambivalent and complex relation to climate concern, instead of a straightforward positive one.

Malka et al. (2009) suggest that a positive relationship between higher education and climate concern is present for people on the political left, but as it relates to the political right, risk messaging only seems to have mild effects on climate change risk perceptions. Formal education can even be linked with less likelihood to believe climate change is occurring, or that it is caused

by humans, or that action should be taken as it pertains to individuals who are oriented toward political conservatism, according to Malka et al. (2019). The current study looks into the association of academic education and climate change risk perceptions.

2.2.4 Socio-cultural factors

Theories of risk perception, including affective and cognitive explanations, have received criticism for depoliticizing risk, and for ignoring the essential role of rivaling cultural and social constructs in forming risk perceptions for individuals (van der Linden, 2015). In order to take cultural differences in risk perception into account, the cultural theory of risk, developed by Douglas (1970), according to van der Linden (2015) has become popular as an approach to measure risk perception. The theory presents a conceptual classification of risk culture based on anthropological research. Four broad rivaling cultural types, or worldviews, are outlined: hierarchism, individualism, egalitarianism and fatalism. Sjöberg (2006) has criticized this approach as faulty, while Marris, Langford & O’Riordan (1998) have criticized it for having weak explanatory power. Sjöberg (2006) points to complications with how to operationalize cultural theory empirically, as well as problems with inferring cultural biases from data harvested from the individual level. Given these theoretical and empirical issues, van der Linden (2015) argues that value orientations are more reliable stand-ins for modeling socio-cultural influences, than the idea of a certain cultural type. Thus, the present work will assess the seemingly more reliable measure of value orientations in order to assess that particular aspect of socio-cultural influence.

Values have been studied for many decades with different scientific disciplines and intellectual traditions taking diverging paths on how to conceptualize it (Corner, Markowitz & Pidgeon, 2014). A convergence among scientists is around the idea that values are considered to be relatively stable aspects of individuals' personalities and behavior, even though values may change over an individual lifetime or through generations, especially in response to socio-cultural changes (Corner et al., 2014). There is also shared interest among social scientists that use different theories to evaluate human values to understand the relation between values and

engagement with environmental risks. According to Corner et al. (2014) there is also convergence among experts around the conclusion that some value orientations are predictive of climate concern, while others are not.

Schwartz (1992) conceptualization of values is dominant in the literature on assessing the link between values and risk perception, according to Corner et al. (2014). Schwartz' research has identified a multitude of universal values that can be categorised into four distinct clusters that range along two dimensions. These two dimensions are self-transcendence (including altruism, loyalty and forgiveness) versus self-enhancement (including ambition, power and hedonism); and openness to change (including self-direction and stimulation) versus a desire to respect/conservate tradition (including conformity and security). Those who identify strongly with values of self-enhancement (e.g. personal achievement, materialism) do not tend to identify strongly with values of self-transcendence (e.g. care for the environment, benevolence) and vice-versa, according to Corner et al. (2014), suggesting that some value orientations are strongly predictive of climate change risk perception, while some are not.

Schwartz's conceptualization is not the only one, as for instance de Groot & Steg (2008) have diverged in their approach to assessing values. De Groot and Steg (2008) categorize the same inventory of value items that were present in Schwartz research into three broad clusters of values: biospheric (i.e. focused on the environment), egoistic (i.e. focused on self) and altruistic (i.e. focused on others). Other approaches that have been more theoretical in nature such as Rohan (2000), have tended to emphasize the idea that values are a latent means of assessing the social world, and Hitlin & Piliavin (2004) suggest that values help to achieve certain behaviors or outcomes and thus act as motivational drives. According to Dietz, Fitzgerald & Schwom (2005) many social-psychological approaches to values focus on altruism. Altruistic and biospheric values can be considered broadly equivalent to Schwartz's conservation and self-transcendence value clusters, while egoistic values match the self-enhancement cluster rather well (Dietz et al., 2005). Despite the conceptual similarities, there are some distinct differences between the theoretical approaches of De Groot and Steg (2008) and Schwartz (1992) and they often co-exist in the literature, according to Dietz et al. (2005).

The way in which values are related to climate change risk perceptions and behaviours in research is often through the utilization of Schwartz' (1992) often-cited theory of basic human values, according to van der Linden (2015). The universalism value orientation is linked with higher levels of concern and lower levels of scepticism about man-made climate change (Prati, Pietrantoni & Albanesi, 2018). The self-direction and hedonism value orientations also seem to correlate with risk perception of climate change and perceived negative repercussions of climate change. Prati et al. (2018) did not find that any other broad value orientation was significantly associated with climate change risk perception. The present study investigates the association between Schwartz' value categories and risk perception of climate change.

Political orientation has become stronger as a predictor of climate concern through time, at least in the U.S. (Driscoll, 2019). Mannerström, Muotka, Leikas & Lönnqvist (2020) suggest that political ideology in Finland tends to be framed one-dimensionally as a left-right dynamic. The political right has traditionally tended to advocate a market economy as free as possible as well as low taxation and considered large income disparities between different demographics to be acceptable as long as there is equality of opportunity for citizens (Mannerström et al., 2020). In contrast, the political left has taken a contrary position on these issues, arguing that increased taxation is necessary to offset unfair differences in outcomes between groups of people (Mannerström et al., 2020). However, these traditional political dividing lines show signs of changing, at least among young Finns (aged 18-29) (Mannerström et al., 2020). According to Borg, Kestilä-Kekkonen & Wass (2020) the socio-economic dimension is still considered to be the most important dividing line politically in Finland, despite structural upheavals of society in recent decades, including increased globalization, changed labor markets, mass migration and risks associated with climate change. Interestingly, all of these upheavals are co-incidentally politically polarized issues, especially in the United States (Driscoll, 2019), but increasingly in Finland as well (Borg et al., 2020).

Recently, a number of competing dimensions of conflict have emerged, which may come to challenge the traditional political paradigm (Mannerström et al., 2020). The National Coalition, the Center Party, the SDP, and the Left Alliance seem primarily to be traditional “economic parties” as their supporters are divided along either the left or the right (Mannerström et al., 2020). However, they are much more scattered between value liberalism and conservatism, according to Mannerström et al. (2020). On the other hand, the Green League and the True Finns seem to be primarily “value parties”, as their supporters are strongly either liberal or conservative, while fundamentally being divided on economic issues. (Mannerström et al., 2020).

According to Borg et al. (2020) every other Green League voter rated environmental issues and climate change as the top priority of the last elections, which distinguishes them from all other parties. The authors also suggest that True Finns voters have moved more toward the right politically, which may be linked to a growing sentiment of climate scepticism among the voting base. The political successes of the Green League, and especially the ongoing growing support for the True Finns indicates a paradigm shift of the political battlefield, from economic to socio-cultural issues, such as immigration and climate change in Finland (Borg et al., 2020). Thus, it is of special interest to examine the supporters of True Finns and Green League supporters to gain some insight into the links between political orientation and climate change risk perception, and the current work will conduct such an investigation.

2.3 Theoretical framework

The chapter begins with a description of the risk perception theory and model developed by van der Linden (2015) in more detail. It acts as a basis for the research questions, which are derived from it. Worth noting is also that the motivations used by van der Linden will also be used as a fundament in the present study. Then, Schwartz’s value theory (1992) is described more in-depth and placed within the theoretical framework of Van der Linden’s model. Schwartz’s value theory fits within the value orientation component in the broader theoretical framework that is provided by van der Linden’s model.

2.3.1 Climate Change Risk Perception Model

The Climate Change Risk Perception Model (CCRPM) supplies a new conceptual framework that merges different fragmented theoretical perspectives from the past into a cohesive whole, that inhabits considerable explanatory power for human risk perception on a broad range of phenomena (van Eck et al., 2020). The CCRPM was designed specifically to assess climate change risk perceptions, but it has applicability, for instance, to study corona-virus risk perceptions (Dryhurst et al., 2020; van Eck et al., 2020).

The four core dimensions of CCRPM are 1) experiential processing factors, such as personal experiences of climate change and the effect of different emotional states on risk perception, 2) socio-demographic factors, including gender, age and academic education 3) cognitive factors, such as knowledge of threats posed by climate change and affective mental associations 4) socio-cultural factors, including values and political orientation. The four dimensions presumably predict climate change risk perceptions strongly (van der Linden, 2015). Indeed, it is suggested to explain up to 70% of all the variance in risk perception. Adding some credence to the suggestion, Xie et al. (2019) replicated the study in a recent Australian study and found similar results.

While these four core factors have proved to be particularly critical in explaining public risk perceptions of climate change, van der Linden (2015) asserts that the theoretical framework is not meant to serve as an absolute explanation, and the predictors included are not to be considered all-encompassing of what risk perception entails. It also merits mentioning that on a neurological level, affective and cognitive processing tend to act in parallel and in continuous interaction with each other, and that both might be conditioned on a third factor, such as differences among cultures, according to van der Linden (2015). Furthermore, the CCRPM does not seek to explore the complex interrelationship between these core factors. Instead, it aims to create a useful framework to help assess the strength that various determinants have on risk perception.

The theoretical framework for this present study is provided by van der Linden's model (2015), but only select parts of it will be utilized. These include those factors that the ESS, round 8 (ESS8) survey dataset provides clear answers for. The model by van der Linden (2015) has

identified socio-cultural (value and political orientation) and socio-demographic (age, gender, academic education) factors as some of the core elements that predict climate change risk perception (van Eck et al. 2020). These are found in the ESS8 dataset and they will be examined in the present study.

Experiential and cognitive factors will not be included in the present study. Despite being core components of van der Linden's (2015) model and seemingly adding powerful predictive power to it, these components are not accounted for in the data set. This is an acknowledged limitation of the current study as it will presumably not have as much explanatory power as it could have, were the experiential and cognitive components evaluated as well.

2.3.2 Schwartz value theory

Schwartz value theory places itself rather neatly within the socio-cultural domain presented by CCRPM, and will therefore be utilized in the present study to provide answers for the research questions pertaining to whether there are associations between some value orientations and climate change risk perception or not, and if yes, which ones are related to climate concern. In addition to identifying universal human motivational values, Schwartz's (1992) theory provides explanations for a dynamic relationship between the values. At the center of this organizational structure of values is the assumption that values guide human judgements and actions toward certain goals. In doing so, certain value orientations share common goals, and others have opposing goals and these give rise to thematic clusters of values such as openness to change (including self-direction and stimulation) versus a desire to respect/conservate tradition (including conformity and security).

Prati et al. (2018) found that universalism, self-direction and hedonism are values that are associated with climate change risk perception, and suggest that universalism and self-direction values in particular are powerful predictors of how climate change is perceived. All ten value categories identified by Schwartz (1992) are included in the present study in order to evaluate how strongly they are associated with climate concern, and to see if findings from previous

research support or contradict the findings of the current work.

2.4 Aim of the study

The purpose of this study is to provide a methodical understanding of the social psychological determinants that underpin climate change risk perceptions. To further this cause, a risk perception model of climate change by van der Linden (2015) is adapted and tested. Sociocultural factors (broad value orientations, political orientation) and sociodemographics (age, gender, academic education) are assessed to test their predictive strength on climate change risk perceptions among Finns. A national sample is used to test the predictive and explanatory power of the risk perception model. The sample is drawn from the European Social Survey, round 8 (2016) data set.

Specifically, the study at hand seeks to respond to the following research questions:

Regarding socio-demographic factors:

1. Is age related to climate change risk perceptions?
2. Is gender related to climate change risk perceptions?
3. Is academic education related to climate change risk perceptions?

Regarding to socio-cultural factors:

4. Are values related to climate change risk perceptions... and if yes, which values?
5. Are there differences in climate change risk perception depending on political orientation?
6. Do value orientation, political orientation, age, gender and academic education together predict risk perceptions of climate change?

The present work is conducted with a pursuit of finding generalizable answers to research questions from a sample, acknowledging that the results may not be statistically significant nor generalizable to the broader Finnish population. Thus, there is an aim to interpret analysis results cautiously.

4 Method

In the following will be a presentation of the methods used to conduct the present study. First, a description of the research design and why it was chosen. Then follows a description of the informants as well as why they were chosen, and how. After that, the measures are presented and lastly, the chosen analysis strategy is discussed.

4.1 Research design

Ontologically and epistemologically the study rests on realism, and is based on the notion that generalisable explanations to climate change risk perceptions can be made, because objective facts exist and they can be measured empirically (Jenkins, 2010). A quantitative study design and the survey method fits well for the aim to make generalisations based on a limited sample using statistical tests. The survey was conducted by ESS (2016, round 8), who collected data on Europeans through structured interviews, including Finns, on climate change risk perceptions among various other items.

With the benefit of inferential statistics and statistically significant data, it may be possible to make inferences of the general population it is supposed to represent (van der Linden, 2015). However, it is important to keep in mind that the data from the sample may prove not to be representative, in which case inferences from the sample cannot be generalized to represent the whole population and even if statistically significant findings are made, the measure results are only an approximation of the actual conditions among the general population.

4.2 Respondents

The respondents included 1925 Finns sampled by European Social Survey (2016, round 8); an adequate sample size to make inferences about a broader target population (van der Linden, 2015), as is the aim of the present study. The survey was designed by ESS, a well-known and reputable polling institution. Its intent was to, among other things, prod public concern and belief in climate change. Furthermore, the questionnaire also had questions that assessed broad value orientations, political party preference and academic education, which the present paper aims to examine. Therefore, it is suitable as a data source for the current paper.

4.3 Measures

A Likert-scale rating was used by ESS8 to provide a quantifiable frame of reference for respondents' answers. The current work utilized these items to operationalize the demographic variables as well as value orientation and party preference and the dependent variable climate change risk perceptions (used synonymously and interchangeably with the term climate concern for varieties sake). The SPSS analysis tool was used to interpret the ESS8 data set.

4.3.1 Climate change risk perception

Three questions with adequate internal consistency in the ESS8 that measured concern and belief in climate change were selected by the present paper. These were transformed with the SPSS program to create a new composite variable; that of broad climate change risk perceptions that includes both levels of concern and belief in climate change. The questions consisted of: "How worried are you about climate change?" (answers were on a Likert scale ranging from 1: "not at all worried" to 5: "extremely worried"), "Do you think the world's climate is changing?" (answers were on a Likert scale ranging from 1: "Definitely changing" to 4: "Definitely not changing") and "Climate change is caused by natural processes, human activity, or both" (answers were on a Likert scale ranging from 1: "entirely natural processes" to 5: "entirely man-made").

In order to combine the three variables into one internally coherent composite variable of risk perceptions of climate change, the scores of the second item ("Do you think the world's climate is changing?") had to be reversed. As a consequence all three items measured climate change risk perceptions in the same direction. Another notable thing is that the Likert scale was inconsistent among the three questions, with 2 out of 3 questions ranging from 1-5, while one ranged from 1-4. This was dealt with by converting the 1-4 scale into a corresponding range by changing its value labels, so that 1=1, 2=2.33, 3=3.66 4=5. A reliable measure was obtained, in that Cronbach's alpha for the composite score of climate change risk perceptions was $\alpha = 0.67$.

4.3.2 Academic education

As it pertains to the variable academic education, the ESS8 dataset provided 14 choices for respondents, ranging from: “less than primary school” to “PhD”. To create the measure, a dichotomous variable was created by combining all academic education and coding it 1. All other forms of education were coded 0.

4.3.3 Political Orientation

Political orientation, or the party preference of respondents was evaluated by their answers to the question “Party voted for in the last national election?”. There were 15 parties to choose from. Three parties (Workers Party, Pirate Party and Freedom Party) were removed from analysis for their problematic size: each had less than ten respondents voting for them in the previous election, prompting their removal. The rest of the parties had above 50 respondents vote for them, and were included in the current paper’s analysis. Since one of the interests of this present study is to examine True Finns and Green League voters' climate change risk perceptions for possible dissimilarities, these two parties were also analysed separately by creating a new dichotomous variable that excluded all other parties. The dichotomized variable was labelled: 0=True Finns, 1=Green League.

4.3.4 Values

Regarding value orientations, there were 21 questions in the dataset that indicated what values informants hold. They were all organized along a standardized Likert scale ranging from 1: “Very much like me” to 6: “Not like me at all”. Drawing on Schwartz’ widely used value theory (1992), the 21 items were recoded into 10 variables that represent 10 distinct themes to value orientation. Questions identifying the respondents' value orientation toward benevolence for instance included: “Important to help people and care for others well-being” and “Important to be loyal to friends and devote to people close”. These questions are to be considered as representing the broader value orientation benevolence. The same formula follows for all 21 items recoded into 10 thematically distinct value orientation variables.

4.4 Analysis strategy

The SPSS analysis tool (v27) was utilized to conduct the analyses. Pearson's correlational analyses were used in research questions that have to do with assessing independent and dependent variable relations. Evaluations of group differences were measured with ANOVA. The question assessing the combined effect of the independent variables on the dependent variable was assessed with linear regression analysis.

A correlational study design has been chosen, because the current paper utilizes a survey conducted by European Social Survey (ESS) and its aim is to evaluate the predictive power of the independent variables political orientation, values, age, gender and academic education on the dependent variable risk perceptions of climate change. Furthermore, as the study involves analysing several variables, in which the relationship includes a dependent variable and one or more independent variables, linear regression analysis will be utilized to assess their shared impact on climate change risk perceptions. Regression analysis is recognized as a powerful statistical method that allows examination of the relationship between two or more variables of interest, specifically the influence of one or more independent variables on a dependent variable (van der Linden, 2015), making linear regression analysis a suitable choice for the present paper.

4.4.1 Age

The research question is formulated as "Is age related to climate change risk perceptions?". A correlational analysis will provide an answer in the form of relational strength between this independent variable and climate change risk perceptions. Noteworthy is that a causal relation cannot be determined with the selected research design. Because the age of respondents as well as the dependent variable climate change risk perceptions are continuous variables, a bivariate analysis was conducted measuring Pearson's correlation coefficient. The Pearson correlation coefficient is a measure of the power of a linear relation between two variables. It is denoted by r .

4.4.2 Gender

The research question is stated as "Is gender related to climate change risk perceptions?". Gender is a dichotomous variable, and so its association with the dependent variable could be analysed through a bivariate measure of Pearson's correlation coefficient. In addition, gender was

analyzed by examining possible differences among men and women in climate change perceptions by way of a univariate analysis, including measuring the means and confidence intervals as well as a t-test (or ANOVA). According to Pallant (2013) t-tests are commonly used to compare the mean score of two groups on some continuous variable, whereas ANOVA is commonly used to test statistical differences among the means of two or more groups.

4.4.3 Academic education

The research question reads as ‘‘Is education related to climate change risk perceptions?’’. As a dichotomous variable (academic/non-academic) was created, its relation to climate change perceptions was measured with Pearson’s r . The creation of a dichotomous variable of education (non-academic/academic) allowed also that it could be used in linear regression analysis.

4.4.4 Values

The research question is posed as ‘‘Are values related to climate change risk perceptions? If yes, which?’’. The initial 21 questionnaire questions were reformed into 10 value orientations in the present paper, drawing on Schwartz’ value theory (1992), which provides 10 themes for broad value orientations, which were utilized in the current work. As the value orientations variables are continuous, a bivariate analysis using Pearson’s r was deployed to measure the strength of the relational strength between each of the ten values and climate change risk perceptions. The value orientation that had the strongest relation to climate change risk perceptions was included in the linear regression analysis.

4.4.5 Political Orientation

At first the research question about political orientation was phrased as: ‘‘Is political party preference related to climate change risk perceptions?’’. However, as party preference is only a categorical variable, and climate change risk perceptions is a continuous variable, it makes sense to pose the question differently, so the question was re-framed to: ‘‘Are there differences in climate change risk perceptions depending on party preference?’’. As it pertains to the analysis of all 12 parties with sufficient sample size, a univariate analysis was conducted to determine whether there are differences among different groups of respondents for the political orientation variable. This research strategy allowed for means and confidence intervals to be measured.

ANOVA and the Bonferroni test were utilized, which is a type of multiple comparison test used in statistical analysis (Pallant, 2013). For the regression analysis, a dichotomous variable that specifically measures True Finns and Green League supporters risk perceptions was also created.

4.4.6 Linear regression analysis

The linear regression analysis was utilized, because it provided answers for the research question: “do age, gender, academic education, political orientation and value orientation together explain climate change risk perceptions?”. A prerequisite for a linear regression analysis, is that all variables must be either dichotomous or continuous and the dependent variable must be continuous. The choice of analysis strategy and operationalization tactics of key variables make a linear regression analysis possible. The linear regression analysis is intended to assess how much predictive power the independent variables cumulatively have on the dependent variable, aligning well with the aim of the current study.

A problem with organizing the linear regression analysis with a political orientation variable with only two, relatively small-sized groups is that many respondents would not be included in the analysis. To circumvent this issue, the linear regression analysis was conducted in three steps. In the first step, demographic factors age, gender and academic education predictive power on climate change risk perceptions were measured. The second step added the effect of value orientation, and the third step added the effect of political orientation. The analysis was conducted twice, on the whole sample (steps 1 and 2) and on the sample with only True Finns and Green League supporters (step 3). This design strategy was chosen to maximize sample representation, while at the same time allowing an examination of the predictive power of being a True Finns or Green League supporter.

4.5 Ethical considerations and reliability and validity aspects

There were no ethical issues related to collection of data, because the data harvesting was conducted by a reputable institution (ESS), which followed procedure on how to gather and present data about humans in a manner that does not infringe upon their right to for instance anonymity and consent.

According to Faber & Fonseca (2014) samples ought not be too big nor too small, because there are limitations inherent in both, which can taint interpretation of the results. They point out that samples that are very small diminish the internal and external validity of a study. In the case of a very small sample size, the results are questionable and likely not representative of any larger population pattern. On the other hand, Faber & Fonseca (2014) claim that samples that are very large have a tendency to identify and reshape differences (that are small) into differences that are statistically significant, despite being practically insignificant. Thus, a very large sample may result in false interpretations of the results (Faber & Fonseca, 2014). Failures in accurately assessing data related to climate change risk perceptions may in turn lead to suboptimal, possibly even harmful, climate change policy decisions, according to Nordhaus (2018) and Lomborg (2020).

5 Results

Firstly, the results of the correlational analyses are presented. This is followed by a presentation of a one-way ANOVA, and finally a description of the three-step results of the regression analyses.

5.1 Socio-demographics

Table 1: Descriptives and correlations of socio-demographic factors and climate concern (N=1910).

	Mean	SD	CC	Age	Gender
CC	3.6	0.6			
Age	50.0	18.9	-.196**		
Gen	-	-	.116**	.052*	
Edu	-	-	.151**	.000	.053**

* $p < 0.05$. ** $p < 0.01$.

As table 1 displays, there was a statistically significant correlation between age and climate concern (-.196, $p < .01$), suggesting that climate concern lowers with age. There was also a statistically significant correlation between gender and climate concern (.116, $p < .01$), indicating that women are more concerned than men. Finally, there was also a statistically significant correlation between education and climate concern (.151, $p < .01$), suggesting that academic education was associated with higher levels of concern. All correlations were weak.

5.2 Socio-cultural factors

5.2.1 Values

Table 2: Correlations of broad value orientations and climate concern (N=1902).

	M	SD	CC	Ben	Uni	Sel	Sti	Sec	Con	Tra	Pow	Ach
CC	3.6	0.6										
Ben	1.9	0.7	.103**									
Uni	2.1	0.7	.285**	-.466**								
Sel	2.4	0.9	.058*	-.169**	-.234**							
Sti	3.3	1.2	.124**	-.195**	-.151**	-.369**						
Sec	2.6	1.0	-.020	-.197**	-.166**	-.056*	.088**					
Con	3.0	1.1	-.111**	-.163**	-.091**	.078**	.147**	-.407**				
Tra	3.0	1.0	-.091**	-.273**	-.188**	-.003	.054*	-.281**	-.416**			
Pow	4.3	1.0	-.017	-.010	.094**	-.183**	-.266**	-.143**	-.152**	.014		
Ach	3.8	1.2	.058*	-.100**	-.029	-.238**	-.408**	-.140**	-.034	.067**	-.561**	
Hed	2.8	1.1	.075**	-.294**	-.157**	-.226**	-.486**	-.123**	.030	-.056*	-.269**	-.332**

* $p < 0.05$. ** $p < 0.01$. CC is short for climate concern (dependent variable). Ben = benevolence, uni= universalism, sel=self-direction, sti=stimulation, sec=security, con=conservation, tra=tradition, pow=power, ach=achievement and hed=hedonism.

Table 2 shows that values correlate with risk perceptions of climate change with varied strength. The association was statistically significant ($p < .001$) for values benevolence (.103), universalism (.285), stimulation (.124), conformity (-.111) and tradition (-.091). The relation was also statistically significant ($p = .001$) for value orientation hedonism (.075). Associations of values self-direction and achievement were also significant ($p < .001$; .058 and .058 respectively). All correlations, with the exception of universalism, were weak. The association between universalism and climate concern was moderate.

5.2.2 Political Orientation

Table 3: Analysis of variance of political orientation and associations with climate concern.

	N	Mean	SD	95% Confidence Interval for Mean
National Coalition Party	291	3.56	0.6	[3.49, 3.62]
Swedish People's Party	68	3.45	0.6	[3.31, 3.59]
Centre Party	293	3.47	0.6	[3.41, 3.54]
True Finns	193	3.39	0.7	[3.29, 3.49]
Christian Democrats	52	3.39	0.6	[3.21, 3.56]
Green League	169	4.02	0.6	[3.93, 4.11]
Social Democrats	194	3.55	0.6	[3.46, 3.64]
Left Alliance	71	3.86	0.6	[3.71, 4.01]

* $p < 0.05$. ** $p < 0.01$.

The confidence intervals at the 95% level showed that there are statistically significant differences between supporters of Green League and the rest of the parties, according to the analysis. The same applied for supporters of Left Alliance in comparison to the rest of the parties, except with Green League where no difference could be established. A one-way ANOVA analysis affirms the finding, $F(7, 1323) = 20.54$, $p < .001$, $\eta^2 = .098$). A Bonferroni post-hoc test also reinforces that Green League and Left Alliance are similar as groups and different than every other party. Additionally, Levene's test was not significant ($p < .099$), thus enabling the analysis. The difference in risk perception between Green League and True Finns supporters was statistically significant.

5.3 Regression analyses

Table 4: correlations of age, gender, education and universalism on climate concern in the whole sample (N=1910).

	M	SD	CC	Age	Gen	Edu
Climate Concern	3.6	0.6				
Age	50.0	18.9	-.196***			
Gender	-	-	.116***	.052**		
Education	-	-	.151***	.000	.053**	
Universalism	2.1	0.7	.285***	-.070**	.174***	.127***

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

As table 4 indicates, all the predictors correlate with climate concern significantly ($p < .001$). Noteworthy is that some correlation between the independent variables exists. There was no concern for multicollinearity.

Table 5: correlations of age, gender, education, universalism, political orientation and climate concern among Green League and True Finns supporters (N=361).

	M	SD	CC	Age	Gen	Edu	Uni
Climate Concern	3.7	0.7					
Age	46.7	15.8	-.163***				
Gender	-	-	.147**	.028			
Education	-	-	.254***	-.029	.097*		
Universalism	2.0	0.7	.402***	.015	.292***	.154	
Political Orientation	-	-	.446***	-.219***	.363***	.374***	-.398***

* $p < 0.05$. ** $p < 0.01$. *** $p < 0.001$

As table 5 shows, all predictors correlate with climate concern significantly ($p < .01$) in the limited sample with only Green League and True Finns supporters. Also of note is the correlation between the independent variables. In particular the dichotomous political orientation correlates significantly, and moderately with all other independent variables. There was no concern for multicollinearity.

Table 6: Examining the explanatory power of age, gender, education and universalism on climate concern in the whole sample (N=1910).

	B	SE B	95 % Confidence Interval	β	p
Step 1					
Age	-.007	.001	[-.008, -.005]	-.202	< .001
Gen	.150	.028	[.095, .205]	.119	< .001
Edu	.235	.036	[.165, .305]	.145	< .001
Step 2					
Age	-.007	.001	[-.008, -.005]	-.218	< .001
Gen	.093	.027	[.067, .120]	.074	< .001
Edu	.182	.035	[.147, .217]	.112	< .001
Uni	.249	.020	[.229, .269]	.274	< .001

Obs. R2 adj. = .075 step 1., R2 adj. = .145 step 2.; R2 = .146 step 2 (p < .001)

The model explained 14,5% of the total variance in climate change risk perceptions/climate concern. Age ($\beta = -.218$) and universalism ($\beta = .274$) seem to have had the most effect. There was no concern for multicollinearity. As they do not correlate, they do not share common variance with climate change risk perceptions.

Table 7: Examining the explanatory power of age, gender, education and universalism on climate concern between Green League and True Finns supporters (N=361).

	B	SE B	95 % Confidence Interval	β	p
Step 1					
Age	-.007	.002	[-.012, -.003]	-.160	.002
Gen	.182	.071	[.111, .253]	.129	.011
Edu	.423	.090	[.333, .513]	.237	< .001
Step 2					
Age	-.007	.002	[-.012, -.003]	-.164	< .001
Gen	.037	.069	[-.032, .136]	.026	.596
Edu	.340	.084	[.264, .424]	.191	< .001
Uni	.377	.050	[.327, .437]	.367	< .001
Step 3					
Age	-.004	.002	[-.006, -.002]	-.100	.034
Gen	-.069	.070	[-.001, .129]	-.049	.325
Edu	.186	.087	[.099, .273]	.104	.033
Uni	.294	.051	[.243, .345]	.287	< .001
Pol	.410	.080	[.330, .490]	.289	< .001

Obs. R^2 adj. = .098 step 1., R^2 adj. = .218 step 2., R^2 adj. = .269 step 3.; R^2 = .227 step 2 ($p < .001$), R^2 = .280 step 3 ($p < .001$). Gen=gender, edu=education, uni=universalism, pol=political orientation.

Table 7 displays statistically significant correlations between all predictors and climate concern. The limited model (N=361) explained 26,9% of the total variance. The impact of age slightly diminishes. The effect of gender is non-existent, and becomes statistically insignificant with added steps. The effect of universalism decreases in the last step, but is moderately strong and about as strong as political orientation. Universalism and political orientation predict climate concern most out of the examined variables.

6 Discussion

The aim of this work has been to offer a more methodical and detailed understanding of the social psychological predictors of climate change risk perceptions among Finns. To serve this cause, a model of climate change risk perceptions was put to the test. The theoretical model developed by van der Linden (2015) was adapted and socio-cultural and sociodemographic factors were combined to seek explanations for and to predict risk perceptions of climate change. A national sample was used in the study, demonstrating the explanatory and predictive force of the model as it pertains to select socio-cultural and socio-demographic factors. The research questions are answered and the results are discussed in this chapter.

6.1 Support for the Climate Change Risk Perception Model

The present study has demonstrated that parts of at least two of the four conceptual dimensions in the model can be validated empirically. Socio-demographic and socio-cultural factors both predicted climate change risk perceptions, together more than a quarter (26,9%) of the variance. Taken as a whole, socio-cultural dimensions were more influential than socio-demographic factors. These results are in alignment with previous research (Hornsey et al., 2016, van Eck et al., 2020). Worth of note is that two components; the cognitive and experiential factors were not tested in the present work, thus the explanatory power was limited. There were almost three-quarters of the total variance that are left unexplained, and cognitive and experiential factors could provide more explanatory power to climate change risk perceptions.

6.1.1 Socio-demographics

The research questions were answered through correlational analyses and all socio-demographic factors assessed were statistically significant predictors of climate change risk perceptions. Younger people, females and highly educated individuals were inclined to perceive climate change as a greater threat than older people, males and individuals without academic education. These findings are in congruence with previous research (Hornsey et al., 2016; van Eck et al., 2020). However, all correlations were weak ($<.200$). Thus, their power to explain climate change risk perceptions among Finns in general is weak. This is in congruence with findings by Driscoll (2019), which suggest that socio-demographic factors are not strong as predictors as they used to

be a few decades ago, and that socio-cultural determinants, such as values and political orientation are stronger predictors of climate change risk perception (van Eck et al., 2020).

Age had a statistically significant ($p < .01$), but practically weak link ($r = -.196$) to climate concern, in the present study. Older people tend to be less inclined to believe in climate change and show less concern than younger people. This finding is inconsistent with other recent research (van Eck et al., 2020), which found that age does not have a significant effect on perception of risk. An explanation for the inconsistency could be that the statistically significant effect of age is so weak that it is of no real significance in a practical sense. Another explanation could be that the Finnish context differs in some critical aspects from other countries that have been assessed, such as the U.S. (Driscoll, 2019), which affects the association between age and climate concern.

Gender had a statistically significant ($p < .01$) link to climate concern, albeit a weak one ($r = .116$). This aligns with previous research (Gustafson, 1998; Finucane et al., 2000), that suggests males tend to be more sceptical and less sensitive risk perceivers than females. The ‘white male’ effect was posited as an explanation in the literature by some scholars, such as Finucane et al. (2000). As there are inclinations that socio-demographic factors are diminishing in effect in lieu of factors such as political orientation (Driscoll, 2019), highlighting whiteness and maleness seems needlessly provocative and divisive as an approach, especially if it activates socio-political tribal instincts. Approaches that have the power to depolarize are suggested to be favored, and those would be multivariate analyses that are not race-baiting.

Academic education had a statistically significant association to climate concern ($p < .01$). However, it is a weak link ($r = .151$) and as previous research has shown, education is an ambivalent indicator of one's level of climate concern. Knight (2016) suggests that higher income and higher education should provide people with an increased sense of control and thus lower risk perceptions. However, the current paper's findings undermine this suggestion, because a significant, albeit weak positive correlation was found. If there were more categories, or levels to education in the analysis, results may have been different, and provided more precision. Thus, operationalisation of the education variable may present reliability and validity issues. It is not

certain that education was accurately represented, and this is a consideration of the validity of the chosen operationalisation of the variable of education. On the other hand, the measurement tool was the survey conducted by an esteemed research organization ESS. Therefore, reliability is fortified to a degree. All in all, socio-demographics accounted for a relatively small amount of variance in climate change risk perceptions in the sample, suggesting they have weak explanatory power, and less than socio-cultural factors, which is in line with previous research (van der Linden, 2015; van Eck et al., 2020).

6.1.2 Socio-cultural factors

The present study focused on assessing broad value orientations and political orientation, in addition to socio-demographic factors, in order to advance understanding of the role of social factors. The research questions were answered through correlational analyses. Results suggest that both values and political orientation predict risk perceptions, which aligns with other recent research (Wang and Kim, 2018; Driscoll, 2019). This also suggests that other socio-cultural determinants, not evaluated in the present study, may be powerful predictors of climate concern, which previous research suggests (Hornsey et al., 2016; van Eck et al., 2020).

Noteworthy when discussing socio-cultural factors is that the analysis bases its conclusions on a sample of Finns, which are part of the Western sphere of influence, which differs in some significant ways from other cultures, for example in terms of what values tend to be prioritized. Western cultures differ from others in part the emphasis of the individual, in contrast to cultures that tend to value collectivism over individualism. Thus cultural differences in climate change risk perception can cause generalization issues, but seen as the study was conducted on a sample of Finns and supposed to reflect Finns, the paper is not aiming for universal explanatory power, but it can be viewed as a limitation nonetheless.

Examination of the effect of values revealed that the universalism value orientation was identified as the strongest association with climate concern ($r = .285$), which supports findings from previous research (Prati et al., 2018). Conformity values correlated negatively with climate concern: prioritizing conformity predicted a relative lack of concern and belief in climate change, which does not find strong support in previous research. However, this association found in the

sample was very weak and is practically insignificant in a generalizable sense. Values power, hedonism and security do not seem to predict climate change risk perceptions one way or the other, since no significant correlations were found. These findings contradict findings by Prati et al. (2019), which found that hedonism is related to climate concern. A possible explanation could be that the values of power, hedonism and security are not clearly linked to climate change perceptually, and thus did not register as significant among respondents or that they were simply irrelevant for climate concern.

It is somewhat unsurprising that universalism values, which prioritize focusing on others well-being, as well as environmental conservation, were found to be positively correlated to climate concern. When it comes to conformity values and the negative correlation to climate concern, the results are somewhat surprising but also somewhat expected, because those that highly value conformity tend to prioritize upholding traditions, maintaining order, and conforming with what the group decides.

As it pertains to political orientation, the study found that party preference was a significant indicator of climate change risk perceptions, a finding supported by previous research (Driscoll, 2019). Previous research has also found differences along left and right political leanings, which was something the present study did not examine. Based on the results, there is some indication that preferring the Green League party is associated with a relatively high level of climate change risk perception, while voting for the True Finns is related with relatively low levels of risk perception. However, there were no significant differences between True Finns and all other parties, except Green League and Left Alliance supporters, suggesting that the perception of risk is not discernibly different among True Finns and most other major Finnish parties (with the exceptions of Green League and Left Alliance voters, who rate themselves significantly more concerned than all other major political parties).

Mannerström et al. (2020) suggest that the Green League and the True Finns are to be considered mainly as “value parties”, instead of the traditional categorization of left and right. To this there

is some indication. Green League supporters were more concerned about the climate than the True Finns supporters and it may be related to a difference in value preferences as Green League supporters prioritize universalism values more than True Finns supporters. Worth of note is also that True Finns did not distinguish themselves statistically significantly from the majority of the major parties in terms of concern for the climate in the sample. One could, however, make the case that since Green League and Left Alliance supporters seem to be aligned on the severity of the issue of climate change, they represent the left wing, but it is harder to argue that True Finns represent the right, or the far right when looking at climate concern specifically, because it is not significantly different than the concern of any other major party, not counting Left Alliance and Green League supporters.

6.2 Regression analyses with the Climate Change Risk Perception Model

Two separate regression analyses were conducted, one assessing the whole sample, and another evaluating only True Finns and Green League supporters. A modified CCRPM was deployed to assess to what degree key socio-cultural and sociodemographic factors can explain and predict climate change risk perceptions. The impact of socio-demographic characteristics; age, gender and education were revealed in step 1. Results of the sample consisting of Green League and True Finns supporters suggest that gender, age and education each predict climate change risk perceptions independently, explaining a total of 9,8% of the variance in climate change risk perception/climate concern ($F(3, 357) = 14.01, p < 0.001, \text{Adj. } R^2 = 0.098$). The results indicate that being younger, female, and highly educated is associated with increased climate concern, which is congruent with some previous findings (van der Linden, 2015).

Step 2 evaluated whether universalism values may explain any supplemental variance in risk perception. The results suggest that universalism values together with the aforementioned socio-demographic factors explain 21,8% of the total variance ($F(1, 356) = 55.84, p < 0.001, \text{Adj. } R^2 = 0.218$). Step 3 assessed the explanatory power of political orientation on climate change risk perception/climate concern, together with the effect of socio-demographic factors and value orientations. Results suggest that political orientation is a significant predictor of climate concern

among Finns, further explaining an extra 5.1% of the variance in climate change risk perception ($F(1, 355) = 26.065, p < 0.001, \text{Adj. } R^2 = 0.269$). The results, furthermore, suggest that preferring the Green League party was associated with a relatively high level of climate change risk perception, while voting for the True Finns was related with relatively low levels of risk perception. Worth of note is that True Finns did not rank climate concern lower as a concern than most other major parties. It was only Left Alliance and Green League supporters that were statistically distinct from the rest in terms of reporting a higher level of concern, according to the analysis. In addition, universalism seems to be more powerful as a predictor for True Finns and Green League supporters compared to the rest of the sample. This might be related to these parties being so called ‘value-parties’, as previous research has suggested (Mannerström et al., 2020). Both universalism and political orientation had about the same predictive power, but independently. All in all, the socio-demographic and socio-cultural variables included explained 26,9% of the variance in climate concern, lending credence and support to the CCRPM, and coming some way in explaining climate concern among Finns.

6.3 Suggestions for public risk messaging and future research

In line with previous research (e.g. van der Linden, 2015) the present papers results support the notion that there are multiple factors that need to be accounted for when analysing differences in climate concern to get as comprehensible and accurate a picture as possible. Thus, recommendation for future research is to view the differences in risk perception among the public as a complex and multidimensional issue, as well as to avoid looking for overly simplistic, one-dimensional explanations of group outcome differences (especially, if they are based on immutable characteristics that can be highly controversial and polarizing, such as race and sex). Multivariate analyses that look at many variables and their combined effect is preferable. These often include race and gender, as they do seem to have an effect. It is important to measure and better understand their role, but not out of context, but instead placed in a broader context of multiple explaining factors.

Further inquiries into the role of values and party preference is recommended. As it specifically pertains to political orientation, society is politically polarized on many issues currently, including climate change, and so it could serve society well to understand the role of political orientation plays in moulding risk perceptions of climate change. In an effort to find means to depolarize the issue, risk messaging ought to be done with great care so as to avoid further polarization.

According to Milfont et al. (2017) it is common to gather information about climate concern and beliefs through public opinion polling. Results from one-time surveys are helpful in offering a view into the climate change risk perception in a given population, but such findings are limited to the degree that inferences can be made. As an example, despite polling results indicating that climate concern increased significantly during the 1980s in the U.S., newer polls indicate that less Americans believe that climate change is a threat than a few years ago, according to Capstick et al. (2015). Analysing polling data longitudinally is advised for future research, rather than cross-sectionally, which was done in the present work.

The present work has implications related to communicating risks about climate change to the public. For instance, the importance of emotions in shaping risk perceptions is underlined, and there is a need for future research to focus on how emotions are affecting climate change risk messaging. Communicating risks of climate change to the public are likely to be more effective when the messages do not merely offer the public with more knowledge about the threats and what needs to be done, or are tailored to different target audiences (van der Linden, 2015). The present work suggests that messaging needs to be relatable to a diverse group of people and to connect on an emotional level, as well as a rational level.

Future research could also benefit from taking into account important differences in determinants between personal and societal risk perceptions. As an example, increased knowledge of the hazards of climate change may lead to more concern from society at large, but according to van der Linden (2015) it does not easily translate into a sense of personalized risk. This may be especially true for citizens of a country like Finland; one of the safest places on earth to live in,

where the effects of climate change are not noticeable in everyday life for most people unless one is looking for signs and patterns that confirm its existence. Experiential differences may vary considerably between nations that will bear the repercussions of unmitigated climate change earlier and more harshly, like coastal, developing countries, than other nations, such as wealthy, relatively safe from climate calamity Finland.

For the communication to be more effective, future researchers, policy-makers and various stakeholders could make strides to inform the public in more personalized ways. This could be done, at least in part, by first identifying values that are highly important to individuals, and then presenting the threat of climate change in a manner that aligns with that value orientation. For example, individuals that highly value security would likely be more receptive to dire messages about the risks of climate change, if the threat is framed in the context of a threat to the security that is of utmost high value. Thus, to combat climate change becomes motivationally aligned to maintaining security.

Recent technological advancements have enabled information flow of previously unfathomable scope, and customized ads have become a normal procedure. This suggests that the technical capacity may exist to target people in a more personalized fashion that does not cause defensiveness and fear but will instead motivate people from all convictions to join in pro-environmental action to mitigate climate change. However, such an approach does not come without its own risks that should be perceived and safeguarded against, with potential over breaches of individuals' right to privacy. If personalized targeting is applied, it should be done within an ethical framework that is transparent and disallows harvesting of personal data without explicit consent.

6.4 Critical voices should not be silenced or ignored

Rosling et al. (2019) suggest that human risk perception is affected by universal instincts. A fear instinct exists, that represents our tendency to pay more attention to frightening things, as well as

an urgency instinct, which makes us want to take immediate action in the face of a perceived impending threat (Rosling et al., 2019). Such instincts have served well in terms of survival in the distant past, but may be harmful in the present moment in dealing with a highly complex, global climate change crisis (Rosling et al., 2019). An argument is made that mitigation efforts should not be governed by fear and biased intuition, but rather by a dispassionate data-driven approach, echoing some of the sceptic sentiments of Nordhaus (2018) and Lomborg (2020).

Rosling et al. (2019) and Lomborg indicate (2020) that climate change alarmism is due at least in part of faulty intuition that assumes things are generally worsening, when in many meaningful respects data suggests humanity is making great strides on multiple fronts, not least in terms of a reducing the global death risk and economic damage of extreme weather events. Lomborg (2020) attributes inaccurate association of extreme weather events and climate change at least in part to mainstream media and, increasingly, social media, which exposes the public to occurrences of extreme weather events around the globe on a daily basis with a framing that it is a foregone conclusion that they are caused by climate change. Rosling et al. (2019) suggest the media feeds into the fear and urgency instincts, partly because that is what the public wants to hear, in that it confirms biased intuitions; our fear and urgency instincts.

Lomborg (2020) asserts that continued global economic growth ought to be a higher priority goal than aggressive emission cuts, because economic growth enables research and development of more efficient and affordable pro-environment technology, thus aiding humanity in adapting with climate change in a sustainable manner. Unintended negative consequences of an ambitious emissions cut policy would likely hit hardest on the poorest countries and the poorest within a country, thus worsening global social inequalities in addition to leaving humanity less well funded and weakened in its ability to mitigate climate change long term (Lomborg, 2020). Thus, hard-to-solve dilemmas with climate change mitigation policies are emergent: how to deal with serious environmental issues optimally in a way that does not cause serious collateral damage to humanity? Is there a fertile middle-ground between scepticism, belief and concern about climate change, or are sceptics more aptly perceived as a monolithic obstacle that hinders urgent, drastic climate change mitigation efforts that are absolutely necessary to avert catastrophe?

Nordhaus (2018) and Lomborg (2020) also make the claim that even if drastic emission cuts were implemented successfully globally, it would not reduce the rate of climate change enough to avert a climate disaster, thus making the economic sacrifices and collateral damage caused by the mitigation efforts unreasonable to endure. In suggesting this, it lends some credence to the criticism levied at Nordhaus (2018) and Lomborg (2020) by Schwartz (2020), that they, as people with academic expert status, are boosting credibility of, and emboldening sceptic perceptions of climate change, and/or its mitigation as a ‘lost cause’.

However, Rosling et al. (2019) and Lomborg (2020) reason that a degree of carefully-placed scepticism may be constructive in dealing with climate change, insofar as it protects from making decisions that are based on misleading intuitions and fear, which is an idea Rosling et al. (2019) also ascribes to. Nonetheless, Mora et al. (2018) and Schwartz (2020) assert that climate change mitigation is a matter of extreme urgency, and that drastic short term emission cuts are necessary, and it seems to be the more widely shared perception among experts in the field, or at least the point of view that is most prominent. However, both Nordhaus (2018) and Lomborg (2020) make it clear that the scepticism they inject into the discourse on climate change is not aimed at climate change, or even its mitigation per-se. Rather, scepticism is aimed at certain mitigation policies that, if implemented, would have dire economic costs, with collateral damage to humanity and our capacity to deal with climate change long term. The arguments put forth by Nordhaus (2018) and Lomborg (2020) ought to be verified or falsified through peer-reviewed research in order to gauge the veracity of their critical claims, instead of dismissing their points of view offhand as some kind of heresy that dare question faith in the realness of climate change. To have a chance at mitigating climate change successfully, it seems reasonable to assume that the approach needs to be data-driven, not faith-based, and dissenting scholarly voices should be reviewed by their peers in a dignified, scientifically robust way.

It seems that the discourse on climate change mitigation is done a disservice if it is framed in such a way that scepticism is automatically seen as something problematic, and an increase of concern seen as public perception that is aligned with reality. There is more complexity and

nance to the issue of climate change. Perhaps there may be some fertile overlap between environmentalism and scepticism that can provide humanity with a better chance at successfully adapting with change?

6.5 Limitations

The present work is not without its limitations. Firstly, it should be noted that results of the study are based on a national sample of Finnish respondents, and the analyses are correlational in nature. The correlational design brings with it the impediment that causal directionality cannot be determined. Also, the extent to which the results are generalizable to other contexts and cultures remains unclear as only a sample of Finns was examined. Furthermore, the degree to which the results from the sample can be generalized to describe and to make inferences about the general Finnish population is something that needs to be done with caution. Despite finding significant statistical correlations, the present work has sought to avoid confusing correlation with causation, and to avoid making strong truth claims. Instead, the findings presented in this work are meant to be taken as cautious approximations of the true conditions of the general population.

A limitation with the inclusion of a dichotomous political orientation variable in the regression analysis is that it shrunk the number of eligible respondents from almost 2000 to less than 400. A smaller sample size impacts the reliability of a survey's results, as higher variability follows, which may in turn increase bias, thus undermining the validity of the study. In order to gain access to the full sample size, while still evaluating the effect of Green League and True Finns supporters' risk perceptions, a compromise was made: a multi-step regression analysis with essentially two parts: one with the whole sample and one with the limited sample of either Green League or True Finns supporter respondents. Noteworthy is that while the statistical significance remained throughout the three-stepped regression analysis, the significance level changed in the limited sample third step for age ($p < .01$) and gender ($p < .05$), and this may be in part because of the smaller sample size.

As the complexity of the phenomenon of climate change risk perception has become more apparent throughout the research process, the choice to make a cross-sectional study instead of a longitudinal one, created some limitations. The study does not present an understanding of

whether, and how much, climate concern is changing through time, which a longitudinal study choice would have enabled, according to Milfont et al. (2017).

Another noteworthy limitation of the current study is that though the goal was to examine key social psychological predictors of climate change risk perceptions, the chosen variables are not all-explanatory. Other influential factors have been identified to impact risk perception in previous research, including experiential and cognitive factors, that were not accounted for. For instance, the omission of the evaluation of the effect of emotion, which previous research suggests is a powerful predictor of climate change risk perception (Sundblad et al., 2007), which when included, may have increased the explanatory power of the evaluation.

In addition, the results of the linear regression analysis conducted only explained little over a quarter of all variance, leaving nearly three-quarters of possible contributing factors fogged from view. Future research could find it fruitful to build upon the present work by more advanced exploration into the multidimensional nature of experiential, cognitive, socio-demographic and socio-cultural components, and how they shape climate change risk perceptions. For that end, a collaborative, multidisciplinary approach seems the most apt approach.

6.6 In conclusion

This work put a social-psychological model of climate change risk perceptions to the test. The model was tried on a national sample, utilizing a range of reliable measures. Results cautiously offer evidence for the influence of socio-demographic and socio-cultural factors that in conjunction explain nearly 27% of the variance in risk perceptions of climate change. While it leaves a substantial amount unexplained, the results nevertheless suggest that party affiliation and universalistic value orientations are associated with climate concern. Lastly, the results of this study, and prior research discussed in this thesis, suggest that climate change risk perception is a multidimensional and complicated phenomenon that should be treated as such.

Hence, communication of the threats should be done with an approach that acknowledges the diversity and complexity of human risk perception. As conservatively leaning people seem to be

most sceptical (Driscoll, 2019), the messaging needs to be more effective and engaging than previously achieved, especially for this information-resistant subgroup. The aim ought to be to depolarize climate change and to forge a bipartisan effort to mitigate its detrimental effects, before it is too late to avoid a catastrophe of global proportions from occurring. Better understanding of the determinants underpinning climate change risk perception is useful in achieving such a goal, as it, among other things, enables personalization of risk messaging so that scientific knowledge of climate change and its impact may be passed down to the public in a more diverse, inclusive and effective way in the future.

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Appendix A.

Supplementary data related to this study (ESS8) can be found at:

<https://www.europeansocialsurvey.org/data/download.html?r=8>