

Climate change perceptions across Europe

From climate change beliefs to climate change mitigation behaviors

Thea Gregersen

Thesis for the degree of Philosophiae Doctor (PhD)
University of Bergen, Norway
2022

UNIVERSITY OF BERGEN



Climate change perceptions across Europe

From climate change beliefs to climate change
mitigation behaviors

Thea Gregersen



Thesis for the degree of Philosophiae Doctor (PhD)
at the University of Bergen

Date of defense: 23.09.2022

© Copyright Thea Gregersen

The material in this publication is covered by the provisions of the Copyright Act.

Year: 2022

Title: Climate change perceptions across Europe

Name: Thea Gregersen

Print: Skipnes Kommunikasjon / University of Bergen

Scientific environment

The project was funded by the Centre for Climate and Energy Transformation (CET), University of Bergen, where I have had my office space. I have also been affiliated with the Department of Psychosocial Science at the Faculty of Psychology, University of Bergen, where I was an associated member of the research group Bergen Laboratory for the Study of Decision, Intuition, Consciousness, and Emotion (DICE-lab). Doctoral training was provided by the Graduate School of Human Interaction and Growth (GHIG), Faculty of Psychology, University of Bergen.

My main supervisor was Rouven Doran, Associate Professor at the Department of Psychosocial Science, University of Bergen. Co-supervisors were Gisela Böhm, Professor at the Department of Psychosocial Science, University of Bergen, and Endre Tvinnereim, Associate Professor at the Department of Administration and Organization Theory, University of Bergen.

Acknowledgments

First and foremost, I want to thank my supervisors for supporting me all the way from writing the project description to submitting this thesis:

Rouven Doran, more than anything for always being so available. You have made it clear that this project is my responsibility – but I still saw us as a team. I could not have asked for a better supervisor.

Gisela Böhm, for betting on me from our very first meeting. For writing the nicest recommendation letter when I was applying for PhD positions, trusting me with the KM group, and always cheering me on when I have had academic or public presentations.

Endre Tvinnereim, for introducing me to the Norwegian Citizen Panel and always making me feel like a colleague rather than a student.

I would also like to thank my co-authors:

Wouter Poortinga, for co-authoring my first two papers and giving me such constructive comments on a draft of the synopsis for my final seminar.

Hans-Rüdiger Pfister, for co-authoring the third paper and for your comments on the synopsis.

And Keri Hartman, for proofreading the synopsis, Paper II and Paper III.

Several others deserve to be acknowledged:

DIGSSCORE (The Norwegian Citizen Panel) and especially the Climate and Environment (KM) group for making me feel useful and important.

Everyone at CET, Håvard for creating my forever favorite research center; Jude and Jesse for being the best possible officemates; Jakob, Kristin, and Stina for being my role models when I first started my PhD; Brooke, and Agnete for being my ‘CET siblings’; and Agnete (again) for working with me on Beyond Oil 2021, for being by

my side through Researcher Grand Prix and for all the hours of Shut-up-and-write. To the new CET generation, including Devyn, Rafael, and Subina: Remember to have fun!

My friends outside of work: Marianne, Marita, Sam, Gøran, Merdl, Leni, Emilie, and Kamilla for wine, pizza, hikes, and Dungeons and Dragons. For all the birthday parties, New Year's Eves and 17th of Mays. And my hometown friends, Nanna and Tina, for hanging out with me every time I have been in Fredrikstad and visiting me in Bergen.

My family, especially my mom, Anne-Grethe, and aunt, Inger-Lill for always being so supportive. And my dad, Bjørn, for driving all the way to Bergen to help me renovate the two apartments I have lived in during the last 10 years.

Sigve, for being my least critical critic. For reading all my papers, watching all my presentations, and being my practice audience. And especially for reading the whole synopsis out loud to me (and commenting on it) when I got corona the last weekend before sending it to proofreading, even though I slept through half of it.

Last but not least, Putte (cat), who has lived with me since I moved to Bergen in 2012. Thanks for 10 years of cuddles.

I've had the time of my life.

Abstract

The overarching aim of the current project was to gain a better understanding of factors influencing climate change risk perceptions across Europe. The project focused on the associations between beliefs about the causes and consequences of climate change, worry about climate change, and climate change mitigation behavior, as well as on people's beliefs about important climate change impacts on the country in which they live. Secondary data from two large cross-national surveys of public perceptions, namely Round 8 of the European Social Survey ($N = 44,387$) and the European Perceptions of Climate Change Project ($N = 4,048$) was used to investigate these relationships in three separate papers. Climate change worry was at the core of the project. While the first two papers focused on the causes and consequences of worry about climate change, the third paper looked more closely at how worry relates to what people imagine the impacts of climate change will be.

Paper I explored the relationship between beliefs about the causes and consequences of climate change (climate change beliefs) and worry about climate change, and how this relationship varies as a function of self-reported political orientation. The results showed that those with stronger beliefs in the anthropogenic nature and negative consequences of climate change reported higher levels of worry. Although there was a positive relationship between such climate change beliefs and worry about climate change independent of political orientation, the relationship was stronger for those placing themselves further left on the political spectrum. Moreover, the relationship between political orientation and worry differed across the countries included in the study and was strongest in Western Europe.

Paper II investigated whether personal or collective efficacy, as well as personal or collective outcome expectancy, influence the relationship between worry about climate change and energy-saving behaviors. In the paper, efficacy refers to beliefs about whether people individually or collectively can use less energy, while outcome expectancy refers to beliefs about whether changes in energy use would help reduce climate change. Two types of energy-saving behaviors were investigated in the study:

curtailment behaviors (habitual or low-cost behaviors such as switching off appliances not currently in use) and efficiency behaviors (long-term investments such as buying energy efficient household appliances). The results showed that climate change worry was more strongly related to curtailment behaviors among those with high levels of personal or collective outcome expectancy and more strongly related to efficiency behaviors among those with high levels of collective outcome expectancy. Worry about climate change explained variance in energy-saving behaviors over and above efficacy and outcome expectancy.

Paper III focused on beliefs about how climate change may affect one's own country, based on survey data from four European countries. Respondents were asked to answer the following open-ended question: 'Climate change may affect different countries in different ways. What do you think will be the most important effect of climate change on [France/Germany/Norway/the UK]?'. The provided answers were sorted into six impact categories describing expected climate change consequences: (1) changes to attitudes and goals, (2) changes to human activities, (3) emissions and pollution, (4) environmental changes, (5) impacts on humans and (6) expectations of few or no impacts. The results revealed that most people associated climate change with environmental changes. Still, certain differences between countries, as well as between demographic and ideological groups, could be identified. For example, those in the age groups 55 – 64 and 65 +, people placing themselves further right on the political spectrum, and men were more likely to expect few or no climate change effects on their country. The results also showed that the six impact categories were differentially related to worry about climate change. Further analyses accounted for the width (number of impact categories mentioned) and depth (how specific the mentioned impact was) of people's open-ended responses and found that both aspects were related to higher levels of climate change worry.

In sum, the reported findings support the notion that climate change beliefs and worry about climate change are relevant predictors of climate change mitigation behavior. This thesis' largest contribution stems from the finding that people's expectations regarding climate change impacts, as well as the relationship between climate change

beliefs, worry, and energy-saving behaviors are conditional on factors such as country, demographics, political orientation, and efficacy beliefs. These findings are relevant for understanding people's emotional and behavioral reactions to climate change and for developing effective communication strategies aimed at different groups.

Sammendrag

Det overordnede målet med dette prosjektet var å få en bedre forståelse av faktorer som påvirker klimarelatert risikooppfatning i Europa. Prosjektet fokuserte på forholdet mellom oppfatninger av klimaendringenes årsaker og konsekvenser, klimabekymring og klimavennlig atferd, samt folks oppfatninger av viktige klimakonsekvenser i landet de bor i. Sekundærdata fra to store tverrnasjonale spørreundersøkelser, Runde 8 av European Social Survey ($N = 44,387$) og European Perceptions of Climate Change Prosjektet ($N = 4,048$), ble brukt for å undersøke disse sammenhengene i tre separate artikler. Klimabekymring var kjernen i prosjektet. Mens de to første artiklene fokuserte på årsakene til og konsekvensene av klimabekymring, så den tredje artikkelen nærmere på hvordan bekymring er relatert til hva folk ser for seg at konsekvensene av klimaendringen vil være.

Artikkel I undersøkte forholdet mellom oppfatninger av klimaendringenes årsaker og konsekvenser (klimaoppfatninger) og bekymring for klimaendringene, samt hvordan dette forholdet kan variere som funksjon av selvrapportert politisk orientering. Resultatene viste at de med sterkere tro på at klimaendringene er menneskeskapte og vil ha negative konsekvenser, rapporterte høyere nivåer av bekymring. Selv om det var en positiv sammenheng mellom slike klimaoppfatninger og bekymring for klimaendringene uavhengig av politisk orientering, så var sammenhengen sterkere for de som plasserte seg lenger til venstre på det politiske spekteret. Videre varierte sammenhengen mellom politisk orientering og klimabekymring mellom landene som var inkludert i studien og den var sterkest i Vest-Europa.

Artikkel II undersøkte hvorvidt personlig eller kollektiv mestringstro, samt personlig eller kollektiv utfallsforventning, kan påvirke sammenhengen mellom klimabekymring og energisparende atferd. I artikkelen refererer mestringstro til troen på hvorvidt folk individuelt eller kollektivt kan bruke mindre energi, mens utfallsforventning refererer til troen på hvorvidt endringer i energibruk kan bidra til å redusere klimaendringene. To typer energiattferd ble undersøkt i studien: reduksjonsattferd (vanemessig eller lite kostbar attferd som å skru av apparater som

ikke er i bruk) og effektivitetsatferd (langsiktige investeringer som å kjøpe energieffektive husholdningsapparater). Resultatene viste at klimabekymring var sterkere relatert til reduksjonsatferd blant de med høye nivåer av personlig eller kollektiv utfallsforventning, og sterkere relatert til effektivitetsatferd blant de med høye nivåer av kollektiv utfallsforventning. Bekymring for klimaendringene forklarte variasjon i energiatferd utover mestringstro og utfallsforventning.

Artikkel III fokuserte på hvilke konsekvenser folk ser for seg at klimaendringene vil ha i landet de bor i, basert på spørreundersøkelser fra fire europeiske land.

Respondentene ble bedt om å svare på følgende åpne spørsmål: 'Klimaendringene kan påvirke forskjellige land på ulike måter. Hva tror du vil være den viktigste effekten av klimaendringene i [Frankrike/Tyskland/Norge/Storbritannia]?' . Svarene ble sortert inn i seks konsekvenskategorier som beskriver forventede klimakonsekvenser: (1) endringer i holdninger og mål, (2) endringer i menneskelige aktiviteter, (3) utslipp og forurensning, (4) endringer i klima og miljø, (5) konsekvenser for mennesker og (6) forventninger om få eller ingen klimakonsekvenser. Resultatene viste at folk flest assosierte klimaendringer med endringer i klima og miljø. Likevel kunne visse forskjeller mellom landene, samt mellom demografiske og ideologiske grupper identifiseres. For eksempel svarte de i aldersgruppene 55 – 64 og 65 +, de som plasserte seg lenger til høyre på det politiske spekteret, og menn oftere at de forventet få eller ingen klimakonsekvenser i landet de bor i. Resultatene viste også at de seks konsekvenskategoriene var ulikt relatert til klimabekymring. Ytterligere analyser undersøkte bredden (antall konsekvenskategorier som var nevnt) og dybden (hvor spesifikke de nevnte klimakonsekvensene var) i de åpne svarene og fant at begge aspektene var relatert til høyere nivåer av klimabekymring.

Oppsummert støtter de rapporterte funnene ideen om at klimaoppfatninger og klimabekymring er relevante prediktorer for klimavennlig atferd. Avhandlingens største bidrag stammer fra funnene som viser at folks forventninger vedrørende klimakonsekvenser, samt sammenhengen mellom klimaoppfatninger, bekymring og energiatferd avhenger av faktorer som landet man bor i, demografi, politisk orientering og mestringstro. Funnene er relevante for å forstå folks emosjonelle og

atferdsmessige reaksjoner på klimaendringene og for å utvikle effektive kommunikasjonsstrategier rettet mot ulike grupper.

List of Publications

Paper I

Gregersen, T., Doran, R., Böhm, G., Tvinnereim, E., & Poortinga, W. (2020). Political orientation moderates the relationship between climate change beliefs and worry about climate change. *Frontiers in Psychology, 11*.

<https://doi.org/10.3389/fpsyg.2020.01573>

Paper II

Gregersen, T., Doran, R., Böhm, G., & Poortinga, W. (2021). Outcome expectancies moderate the association between worry about climate change and personal energy-saving behaviors. *PLoS One, 16*(5). <https://doi.org/10.1371/journal.pone.0252105>

Paper III

Gregersen, T., Doran, R., Böhm, G., & Pfister, H-R. (2022). *Expected Climate Change Consequences – And Their Role in Explaining Individual Risk Judgments Across Four European Countries* [Manuscript submitted for publication].

Contents

Scientific environment	3
Acknowledgments.....	5
Abstract.....	7
Sammendrag.....	11
List of Publications	15
Contents	17
1. Introduction	19
1.1 <i>Climate change beliefs.....</i>	22
1.2 <i>Worry about climate change.....</i>	23
1.3 <i>Climate change mitigation behavior</i>	25
1.4 <i>Factors influencing beliefs, worry, and behavior.....</i>	27
1.4.1 Country context.....	29
1.4.2 Political orientation.....	30
1.4.3 Efficacy beliefs.....	32
1.5 <i>Purpose, aims, and research questions</i>	34
2. Methodology	37
2.1 <i>Participants and procedure</i>	37
2.1.1 Paper I and Paper II: European Social Survey	37
2.1.2 Paper III: European Perceptions of Climate Change.....	38
2.2 <i>Paper I.....</i>	39
2.2.1 Materials	39
2.2.2 Data analysis	39
2.3 <i>Paper II.....</i>	40
2.3.1 Materials	40
2.3.2 Data analysis	41
2.4 <i>Paper III.....</i>	42

2.4.1	Materials	42
2.4.2	Data analysis	43
3.	Empirical findings.....	45
3.1	<i>Paper I.....</i>	<i>45</i>
3.2	<i>Paper II.....</i>	<i>46</i>
3.3	<i>Paper III.....</i>	<i>47</i>
4.	Discussion	49
4.1	<i>Theoretical implications.....</i>	<i>49</i>
4.1.1	Climate change beliefs and worry about climate change.....	49
4.1.2	Worry about climate change and climate change mitigation behavior	52
4.1.3	Expected climate change impacts.....	58
4.1.4	Country context.....	60
4.2	<i>Methodological considerations</i>	<i>61</i>
4.2.1	Causality	62
4.2.2	Validity.....	63
4.2.3	Linearity.....	66
4.2.4	Type I and Type II errors.....	66
4.2.5	Representativeness	67
4.3	<i>Practical implications.....</i>	<i>67</i>
4.4	<i>Ethical considerations.....</i>	<i>69</i>
4.4.1	Using secondary data	69
4.4.2	Objectivity	70
4.5	<i>Conclusion.....</i>	<i>71</i>
	References	73

1. Introduction

It is unnecessary to create anxiety. But the paradox is that we don't solve problems unless we see them as problems (Magnason, 2020, p. 192).

Although the scientific consensus on anthropogenic climate change is overwhelming, the international community has not yet been successful in implementing sufficient mitigation efforts to keep on track to limit global warming to below 1.5 degrees Celsius (IPCC, 2021). Changes in public perception, as well as in lifestyle and behavior, are critical to enabling and expanding our options for climate change mitigation and adaptation (IPCC, 2022a, 2022b). Technological progress, for example regarding renewable energy sources, can play an important role in climate change mitigation. However, the successful development and adoption of renewable energy depends on public acceptance (Boudet, 2019; Toke, 2005). Furthermore, reducing energy demand lowers the potential mitigation risks stemming from increased energy production and supply (Creutzig et al., 2018; von Stechow et al., 2016).

Insight into public perceptions¹ of climate change is key for building engagement and predicting policy support, technological adoption, and climate mitigation behavior (Whitmarsh & Capstick, 2018). Although psychology has already made a substantial contribution with theory and research on public perceptions and behavior (Clayton & Manning, 2018; Nielsen et al., 2021; Swim et al., 2009), there is a call for further research to assist climate change mitigation and adaptation (APA Task Force on Climate Change, 2022).

One factor that has been highlighted as a barrier to individual and societal climate mitigation efforts is public skepticism towards the reality, causes, or consequences of climate change (Poortinga, Spence, Whitmarsh, Capstick, & Pidgeon, 2011; Rahmstorf, 2004). However, research shows that most people, across countries, now agree that the climate is changing, that this is at least partly caused by human activity,

¹ Climate change 'perceptions' reflect "the cognitive (e.g., knowledge), affective (e.g., emotional), and evaluative (e.g., perceived risk) dimensions of individuals' internal representation of the issue" (Whitmarsh & Capstick, 2018, p. 13).

and that the consequences will be mostly negative (Leiserowitz, Carman et al., 2021; Leiserowitz, Maibach et al., 2021; Poortinga et al., 2018). Still, the level of climate change worry is quite moderate; only 28% of people across the 23 countries included in Round 8 of the European Social Survey are ‘worried’ or ‘extremely worried’ about it (Poortinga et al., 2018). One important question, then, is how and when beliefs about the causes and consequences of climate change are related to worry and when climate change worry translates into a motivation to act against the threat.

Characterized by a high degree of uncertainty, causes and consequences that are not directly observable, and the need for collective action, climate change is a highly relevant case for risk perception research (Swim & Whitmarsh, 2018). A reason not to worry, or at least to worry less, is thinking of climate change as somewhat distant (Reser, Bradley, & Ellul, 2014; Spence, Poortinga, & Pidgeon, 2012), for example by believing that negative impacts will mainly affect geographically remote places (Leiserowitz et al., 2020; Schultz et al., 2014; Tvinnereim et al., 2020). However, as the worldwide consequences of climate change become more apparent (IPCC, 2022a), people increasingly report seeing climate change as a global emergency (Flynn et al., 2021) and mention it as a major challenge for their own country (Pew Research Center, 2019, 2020). Still, lowering the perceived spatial distance of climate change is likely not enough to initiate climate change engagement (for an extended discussion of this, see Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015; Brügger, Morton, & Dessai, 2016).

Rather than being based on an “objective” assessment of the likelihood and severity of consequences, risk perception is subjective and intertwines with a range of other judgments and characteristics (Slovic, 1987). For example, climate change risk perception might be influenced by the perceived importance and relevance of climate change causes and consequences for one’s needs or goals, and the degree to which climate change mitigation aligns with one’s standards, norms, and values (Scherer, 1999). In line with this, research has found that socio-cultural factors can influence people’s attitudes towards climate change. Most notably, political orientation has been a consistent predictor of climate change beliefs (Driscoll, 2019; Hornsey, Harris, Bain,

& Fielding, 2016; McCright, Marquart-Pyatt, Shwom, Brechin, & Allen, 2016) and concern about the environment or climate change (Cruz, 2017; Poortinga, Whitmarsh, Steg, Böhm, & Fisher, 2019). Predictors of climate change perceptions have also been found to differ between countries (Hornsey, Harris, & Fielding, 2018; Lee, Markowitz, Howe, Ko, & Leiserowitz, 2015; Lewis, Palm, & Feng, 2019; Poortinga et al., 2019; Smith & Mayer, 2018). As argued by Van der Linden et al. (2017), both cultural and cognitive factors can be valid explanations for risk perception and both should be taken into account if the goal is to understand reactions to climate change.

Motivation to act against a threatening situation is not only determined by appraisals of the risk itself (how harmful the potential impacts would be and how likely they are to be experienced), but also by appraisals of one's ability to cope (whether one would be able to act and whether this action would successfully prevent harm) (Lazarus & Folkman, 1984; Rogers, 1975). Beliefs about coping are based on efficacy beliefs (Bandura, 1977), the degree to which action seems possible and effective in solving a threat. Due to the collective nature of climate change, beliefs about whether people can work together to act against climate change might be particularly important, but have been less researched (Koletsou & Mancy, 2011; Lubell, Zahran, & Vedlitz, 2007).

The present project contributes to the current state of knowledge by broadening our understanding of the conditions that underlie individuals' willingness to accept climate change as a risk and the relationships between subjective risk judgments and people's intentions to address the issue. The three papers address topics ranging from climate change beliefs to worry about climate change and climate change mitigation behaviors, along with individual-level factors like political orientation and personal and collective efficacy beliefs, which are formed in specific socio-cultural contexts. The findings can help us gain a better understanding of reactions to proposed policies and mitigation actions, and develop more effective communication or educational campaigns. In the following sections, the project's theoretical and empirical foundations are presented.

1.1 Climate change beliefs

People's understanding and awareness of climate change, including their beliefs about the degree to which climate change is happening, is caused by humans and will have negative consequences, is highly relevant. What people think about the causes and consequences of potentially threatening situations influences their emotional and behavioral reactions (Bostrom, 2017; Wolf & Moser, 2011), and incorrect beliefs might lead people to avoid taking action or support or enact ineffective solutions. Furthermore, knowledge of the public understanding, as well as the relationship between different beliefs and engagement, is central for communication efforts, as "effective communication must focus on the things that people need to know but do not already" (Morgan, Fischhoff, Bostrom, & Atman, 2002, p. 19).

Several large-scale surveys have used close-ended questions to tap into the degree to which people think humans are influencing the climate and how negative the consequences of climate change will be. These beliefs are often referred to as 'climate change beliefs' or 'climate change perceptions' in the literature, and they have repeatedly been found to be connected to climate change risk perception (Böhm, 2003; Lee et al., 2015; Shi, Visschers, Siegrist, & Arvai, 2016; Tobler, Visschers, & Siegrist, 2012; Van Valkengoed, Steg, & Perlaviciute, 2021).

Another way to tap into people's beliefs about climate change causes and consequences is to analyze answers to open-ended questions. Open-ended questions make it possible to gain an understanding of people's unprompted climate change beliefs. Previous research utilizing this method has mainly focused on what people broadly associate with the term 'climate change' (for an overview, see Tvinnereim & Fløttum, 2015). Many answers to general open-ended questions about climate change include reflections about its consequences, particularly environmental impacts (Leiserowitz, 2006; Punter, Ochando-Pardo, & Garcia, 2011; Smith & Leiserowitz, 2012; Whitmarsh, 2009). Furthermore, the type of climate change associations people make is related to their risk judgments (Smith & Leiserowitz, 2012).

In sum, people's beliefs about the causes and consequences of climate change can influence whether they perceive climate change to be a risk. Different causes and consequences might be seen as more or less personally relevant and possible to mitigate or adapt to. Although previous research has identified a relationship between climate change beliefs and risk perceptions, we know less about people's free associations regarding climate change consequences. The current project focuses on climate change beliefs by looking at people's perceptions of the anthropogenic causes and negative consequences of climate change as well as their unprompted expectations regarding climate change impacts on their own country.

1.2 Worry about climate change

Several measurements have been used in surveys to explore climate change risk perception among the general public; for example, asking people how worried or concerned they are about climate change, how serious they expect the consequences of climate change to be, or how likely it is that severe impacts will happen (Van der Linden, 2017). According to Van der Linden (2017), these different concepts can be seen as elements of a 'hierarchy of concern', which can be illustrated as a pyramid spanning from broad and general likelihood ratings, through perceived severity and generalized concern, and ending in personal worry. Although the concepts have sometimes been used interchangeably in the literature, they are assumed to each have a different relationship with behavioral reactions. Worry is thought to be closely related to behavior, while generalized concern, severity beliefs, or likelihood ratings in isolation do not motivate action (Van der Linden, 2017).

While worry is an emotional reaction with a cognitive component, environmental concern is less experiential and can be seen as more of an 'attitude' towards or evaluation of climate change (Fransson & Gärling, 1999). The risk-as-feelings hypothesis (Loewenstein, Weber, Hsee, & Welch, 2001) highlights the role of emotions in risk-related behavioral reactions and emphasizes that emotional and

cognitive reactions to uncertain situations can diverge. Although affect and emotions² have been established as preeminent predictors of climate change perceptions, policy support, and both mitigative and adaptive behavior (Brosch, 2021; Pihkala, 2022; Smith & Leiserowitz, 2014), most research has focused on the more cognitive components of climate change perceptions (Brosch & Steg, 2021).

Worry is an emotional response to the anticipation of uncertain and potentially dangerous future situations (Borkovec, Robinson, Pruzinsky, & DePree, 1983). In addition to being confused with more cognitive risk perception concepts, non-pathological worry about climate change is sometimes confused with other threat-related emotional reactions, such as ‘fear’ or ‘anxiety’. Fear is related to the fight-or-flight defense system (Misslin, 2003) and is a more overwhelming and short-lived emotion that serves the function of solving a direct threat (Ojala, Cunsolo, Ogunbode, & Middleton, 2021). While fear is generally a legitimized and reasonable reaction to a potentially dangerous situation, anxiety reflects an excessive and irrational fear reaction (Skre, 2022). Compared to fear and anxiety, worry is a more cognitive and less intense response to risk (Borkovec et al., 1983). Climate change worry differs from pathological manifestations of anxiety because it is rational to expect serious consequences of climate change and should not be considered a mental illness (Clayton, Manning, Speiser, & Hill, 2021).

In line with this distinction between threat-related emotions, anxiety and worry show different associations with mental health-related outcomes. Climate change anxiety has been found to relate to general measures of depression and anxiety (Clayton & Karazsia, 2020). In contrast, previous studies have reported either small or non-significant correlations between worry about global warming and trait pathological worry³ (Verplanken et al., 2020; Verplanken & Roy, 2013), in addition to weak relationships between mental health and climate change worry (Berry & Peel, 2015). Still, enduring high levels of climate change worry can be discomforting or even

² See Brosch (2021) for an explanation of the difference between affect, appraisal, and emotion.

³ In the cited papers, trait pathological worry is measured with the Penn State Worry Questionnaire (Meyer, Miller, Metzger, & Borkovec, 1990) and refers to a generalized tendency to worry about a range of different issues (Verplanken, Marks, & Dobromir, 2020).

harmful at the individual level (Borkovec et al., 1983; Doherty & Clayton, 2011; Ojala et al., 2021; Sciberras & Fernando, 2021; Sweeny & Dooley, 2017).

Further support for the distinction between worry and anxiety is found in research predicting behavior. Emotions are closely related to behavior (Brosch, 2021; Frijda, 2010), with different emotions related to different action tendencies (Frijda, 1987, 2004). In line with this, previous studies have reported that climate anxiety is unrelated to pro-environmental behavior (Clayton & Karazsia, 2020), while worry shows a positive association (Verplanken et al., 2020; Verplanken & Roy, 2013). Worry has been established as a motivator for a range of different behaviors (for an overview, see Sweeny & Dooley, 2017). With regard to climate change, research has found worry to predict support for public action (Van der Linden, Leiserowitz, & Maibach, 2019), climate policy support (Bouman et al., 2020; Goldberg, Gustafson, Ballew, Rosenthal, & Leiserowitz, 2020) and seeing climate change as an important voting issue (Campbell, Kotcher, Maibach, Rosenthal, & Leiserowitz, 2021).

The current project follows a definition of climate change worry as “an active emotional state that is often closely linked to adaptive behavioral responses aimed at reducing a particular threat” (Van der Linden, 2017, p. 24). Worry might motivate climate action in several ways: (i) worry indicates that the situation is serious, (ii) frequent negative thoughts remind people that they should take action against the feared outcome, and (iii) people seek to reduce the unpleasantness of the emotional state itself (McCaul & Mullens, 2003; Sweeny & Dooley, 2017). Worry elicits problem-solving aimed at preventing or coping with a fearful situation (Borkovec et al., 1983) and there is clear support for its motivational benefits (Ojala et al., 2021; Sweeny & Dooley, 2017).

1.3 Climate change mitigation behavior

Research within the field of environmental psychology has been criticized for focusing too heavily on behaviors with little effect on mitigating climate change (Nielsen, Clayton et al., 2021; Nielsen, Cologna, Lange, Brick, & Stern, 2021). Pro-

environmental behaviors⁴, such as recycling, do not necessarily have a large or direct effect on climate change mitigation. Pro-environmental behaviors and climate change mitigation behaviors might also have different predictors. For example, research has found that although older individuals generally report being less concerned about climate change specifically, this is not the case for other environmental issues, such as air and water pollution, biodiversity, and resource depletion (Urban & Ščasný, 2012). Additionally, although far-right political groups have often adopted a pro-environmental stance regarding nature conservation, this generally does not apply to the issue of climate change (Forchtner, Kroneder, & Wetzel, 2018).

The 2022 IPCC report focusing on climate change mitigation highlights that demand-side measures, in general, have the potential to reduce GHG emissions by 40–70% in end-use sectors by 2050 (IPCC, 2022b). Energy use is the biggest contributor to human greenhouse gas emissions (IPCC, 2014), and residential energy use accounts for a substantial share of total energy consumption in Europe (IEA, 2021). It is estimated that people in high-consumption societies, including several European countries, must reduce their household energy use by about 73% to reach the goals of the Paris agreement (Moore, 2015). Furthermore, changes in energy use will play an important role in whether renewable energy becomes a supplement to, rather than a replacement for, other energy sources. In line with this, energy plays a key role in the IPCC climate change reports (IPCC, 2022a, 2022b) and the European Green Deal (European Commission, 2019).

With regard to household energy-saving, it is important to differentiate between energy curtailment and energy efficiency actions. While energy curtailment behaviors reflect frequently repeated behaviors, such as turning the thermostat down at night, energy efficiency behaviors reflect one-time or infrequent investments, such as investing in efficient household appliances or insulating the house (Karlin et al., 2014). Increases in energy efficiency generally have the greatest saving potential in households (Dietz, Gardner, Gilligan, Stern, & Vandenberg, 2009; Gardner & Stern,

⁴ Pro-environmental behaviors can be defined as “behaviour that harms the environment as little as possible, or even benefits the environment” (Steg & Vlek, 2009, p. 309).

2008). Still, consumers have been found to overestimate the saving potential of curtailment-related behaviors in comparison to efficiency-related measures (Attari, DeKay, Davidson, & De Bruin, 2010; Gardner & Stern, 2008; Kempton, Harris, Keith, & Weihl, 1985).

Misconceptions regarding the saving potential of different behaviors appear to be quite stable over time, and Lundberg, Tang, and Attari (2019) report that ‘turning off the lights’ continues to be the most frequent response when people are asked unprompted about the most effective action they are currently taking to save energy. These faulty beliefs are relevant because the perceived effectiveness of energy-saving behaviors might influence what people do to save energy, and how curtailment and efficiency behaviors relate to other factors, such as climate change perceptions. Cologna, Berthold, and Siegrist (2022) report that people tend to misjudge the mitigation potential of a range of pro-environmental behaviors, not only energy-saving behaviors, and that high and low impact mitigation behaviors can have somewhat different predictors. The current project focuses on predicting climate change mitigation behavior, specifically personal energy curtailment behaviors and energy efficiency behaviors.

1.4 Factors influencing beliefs, worry, and behavior

In addition to individual beliefs, risk perception is influenced by the social, political, and cultural environment surrounding the risk (Renn & Rohrman, 2000). Beliefs about probability, severity and vulnerability related to risk can be amplified or attenuated by psychological, social, institutional, and cultural processes (Kasperson et al., 1988). The role of socio-cultural factors as a complement to the more traditional individual and cognitive psychological explanations of risk perception has been particularly emphasized in sociological and cultural research (Douglas & Wildavsky, 1982). As argued by Dake (1991): “...mental models of risk are not solely matters of

individual cognition but also correspond to worldviews entailing deeply held beliefs about society” (p. 62)⁵.

People who share a physical, social, or political context might generate a collective understanding of *what* is affected by climate change (e.g., human health vs environmental damage) and to what degree such consequences are considered relevant and acceptable (Burgess, 2015). The present and future impacts of climate change range from water and food scarcity to sea level rise, heat waves, and social disruption (IPCC, 2022a). Each of these consequences might be seen as more or less of a concern in different countries and by different groups within a country. In line with this, Burgess (2015) argues that the risks that are endorsed or ignored by a society “do not reflect the scale of the threat or efficacy of how it might be managed, so much as beliefs about values, social institutions, nature and moral behaviour” (p. 61).

Focusing on people’s risk *perception* underscores how risks are not determined by objective hazards alone, but also depend on social, cultural, and political influences (Slovic, 1999). These influences might affect how information about a risk such as climate change is processed. The process of motivated reasoning (Kunda, 1990) highlights how people accept and evaluate information in a biased manner, by attending to, interpreting, or emphasizing information in a way that supports their pre-existing worldviews, values, and ideologies⁶. The goal of motivated reasoning can be to maintain one’s prior beliefs or to protect one’s identity and values by rejecting uncomfortable information. The motivation to process information in a biased way might stem from a range of different sources, such as belonging to a certain age group, vocation, or political affiliation. In order to react to a risk one must first notice an issue, then interpret it as a problem, and finally feel a sense of responsibility (Frantz &

⁵ Mental models can be defined as a person’s simplified cognitive representation of how something in the world works (Craik, 1943). Mental models about climate change include general knowledge about the climate system, beliefs about climate change impacts, relevant actors, and which regions and people will be most affected (Böhm & Pfister, 2001). Mental models have been highlighted as especially important for risk perceptions, decision-making, and problem-solving because beliefs about causes and consequences, which are at the core of a mental model, help people predict the future (Bostrom, 2017).

⁶ Related concepts include biased assimilation (Corner, Whitmarsh, & Xenias, 2012; Lord, Ross, & Lepper, 1979) and confirmation bias (Nickerson, 1998). For a review of attentional and perceptual biases, see also Luo and Zhao (2021). Several of these mechanisms are related and can be placed under the umbrella term of motivated reasoning (Druckman & McGrath, 2019).

Mayer, 2009; Swim & Whitmarsh, 2018). Motivated reasoning might influence each step of this process; people might avoid climate change information, might not think of climate change as a serious or urgent issue, and/or might not see themselves as responsible for mitigation.

Both the relationship between climate change beliefs and worry and that between worry and behavior are likely affected by cultural, political, and social factors, which can differ both between and within countries. These factors might also relate to people's expectations of climate change consequences. The current project focuses on how people's risk perception and reaction to risk can be influenced by the country context (see Section 1.4.1), their political orientation (see Section 1.4.2), and efficacy beliefs (see Section 1.4.3).

1.4.1 Country context

Although important risk characteristics seem to be relatively universal, the cultural environment can influence why some risk characteristics are emphasized while others are ignored (for an overview, see Renn & Rohrman, 2000). Appraisal patterns, such as the type and intensity of an emotional reaction, as well as the nature of an emotion-eliciting event, are also likely to depend on cultural meaning structures (for a discussion on this, see Scherer, 1999). In line with this, a range of country-level conditions have been associated with individual climate change perceptions. These include economic development, democracy, and carbon emissions (Pohjolainen et al., 2021), political and institutional responses to events, as well as national media coverage (Cologna, Bark, & Paavola, 2017; Nicholson-Cole, 2005). Additionally, several socio-economic and contextual factors, such as energy access and electricity prices, are likely to influence energy-saving in households (Borožan, 2018).

The current project includes two levels of analysis: the individual level and country level. People within a country might share certain characteristics that influence what they consider important climate change consequences, as well as their level of worry about climate change and their energy-saving behaviors. A large amount of previous research on climate change perceptions, especially regarding the influence of political

orientation, has been conducted with samples from the US. The goal of the current project was not to compare specific countries, but rather to investigate whether the risk perception process could be generalized across Europe while controlling for homogeneity within countries.

1.4.2 Political orientation

Political orientation has been highlighted as a core factor for predicting climate change perceptions. This is partly due to the politicization and increasing polarization of the issue during the mid-to-late 2000s, which was especially apparent in the US (Brewer, 2012; McCright & Dunlap, 2011). Although socio-demographic factors such as age and education used to be consistent predictors of climate change concern, their influence seems to have declined compared with political orientation over the last three decades (Driscoll, 2019; Hornsey & Fielding, 2020).

Political orientation has not only been established as an important direct predictor of climate change attitudes (Cruz, 2017; McCright, Dunlap, & Marquart-Pyatt, 2015; McCright & Dunlap, 2011), but also as a moderator of the effects of education (Drummond & Fischhoff, 2017), objective knowledge (Tranter, 2020) and self-assessed understanding (Hamilton, 2011). In line with the literature on motivated reasoning, even the relationship between experience with extreme weather and climate change worry can differ based on political orientation due to differences in attribution (Ogunbode, Demski, Capstick, & Sposato, 2019).

One prominent approach to describe how and why political ideology affects our perception of risks is the cultural cognition thesis⁷ (Kahan, 2012), which was developed from the cultural theory of risk (Douglas & Wildavsky, 1982). The cultural cognition thesis posits that risk perception is influenced by worldviews, in the sense that an individual focuses on some risks while ignoring others based on values that define their cultural identity: their ‘preferred way of living’. The tendency to filter information in a way that fits with existing beliefs and values makes it possible to protect one’s political identity (cf. identity-protective cognition; Kahan, 2010; Kahan

⁷ For a critique, see Van der Linden (2015) or Van der Linden, Leiserowitz, and Maibach (2017).

et al., 2012). The solution aversion model by Campbell and Kay (2014) further emphasizes that it is not necessarily climate change itself that is the reason for motivated disbelief, but opposition to the proposed mitigation solutions.

The left-right dimension has long been the most common way to classify ideological orientation (Jost, Federico, & Napier, 2009). Ideologies consist of a set of values, beliefs, and opinions; right-leaning ideologies are generally related to a preference for social stability and tradition, while left-leaning ideologies are related to a preference for social change and progress (Jost et al., 2009). Three ideological aspects have been highlighted as especially relevant with regard to climate change perceptions: individualistic values (favoring the interest of the individual over the group), hierarchical values (favoring rank-order differences), and free-market ideology (opposing government intervention or regulation) (Hornsey & Fielding, 2020). For example, because people generally believe that climate change will have a larger negative impact on distant people and places (Leiserowitz et al., 2020; Schultz et al., 2014; Spence et al., 2012; Steentjes et al., 2017; Tvinnereim et al., 2020), the way ideologies relate to risks affecting others (individualistic versus collectivistic values) is highly relevant.

In the US, the intensity of ideological or partisan identification is more closely related to climate change beliefs among self-proclaimed conservatives compared to self-proclaimed liberals (Hamilton, Hartter, & Grimm, 2020; Morin-Chassé & Lachapelle, 2020). Still, motivated reasoning is likely to happen independently of where one places oneself on the political dimension. In the same way that solution aversion can drive skepticism, solution acceptance might increase the likelihood of accepting climate change as a threat. Right-leaning individuals who are more likely to fear that climate change mitigation could destabilize the economy, lead to more government intervention and stricter regulations on industry and individual behavior are likely 'motivated' to see climate change as less of a risk. On the other hand, a threat that could lead to societal changes and require international cooperation might be less challenged by left-leaning individuals. Consequently, the interaction between risk and

social processes can lead to both amplification and attenuation of risk information (Kasperson et al., 1988).

In addition to cognitive biases driving motivated reasoning at the individual level, people follow political party cues and are more concerned about climate change if they perceive their party to be concerned (Linde, 2020). People might even reject climate science to differentiate themselves from the opposing party (Merkley & Stecula, 2018). As emphasized by Kasperson et al. (1988): “to the extent that risk becomes a central issue in a political campaign or in a conflict among social groups, it will be vigorously brought to more general public attention, often coupled with ideological interpretations of technology or the risk-management process” (p. 185).

The way a person subjectively evaluates the personal significance of an object or situation forms the basis for their emotional reaction to it (Scherer, 1999). In other words, even when people accept the same climate change information and update their climate change beliefs, the emotional outcome of their perceptions might differ due to differences in priorities. Just as motivated reasoning can drive skeptical attitudes toward climate change, it might also influence people’s level of worry about it. Chapman, Lickel, and Markowitz (2017) argue that emotional reactions to a message differ based on worldviews and preexisting beliefs and that such effects are “very likely amplified in the case of climate change due to a unique combination of extreme public polarization and features of the issue itself known to affect engagement, such as abstractness and long time horizons” (p. 852). The current project investigates interaction effects between political orientation and climate change beliefs in predicting climate change worry.

1.4.3 Efficacy beliefs

People’s response to risk depends not only on perceptions of the threat itself, but also on whether people think they can cope with it (Maddux & Rogers, 1983). Efficacy beliefs (used here as an umbrella term) are at the core of coping appraisals and different operationalizations of the construct have been found to relate both to climate change mitigation actions (Bostrom, Hayes, & Crosman, 2019; Chen, 2015; Clement,

Henning, & Osbaldiston, 2014) and adaptation behaviors (Van Valkengoed & Steg, 2019). Efficacy beliefs are domain-specific and can be differentiated into self-efficacy (beliefs about whether one is able to take action) and outcome expectancy (beliefs about whether action would be effective) (Bandura, 1977). People's sense of efficacy is formed within their social environment and stems from four main sources: previous accomplishments, vicarious experiences provided by social models, social persuasion, and interpretations of emotional and physical states (Bandura, 1994).

While the concept of self-efficacy traditionally focused on individual perception and behavioral responses (Bandura, 1986), later conceptual developments have emphasized the importance of beliefs about collective action (Bandura, 2000; Koletsou & Mancy, 2011; Lubell et al., 2007). Due to the global and collective nature of climate change, many believe that their individual action (alone) is insignificant (collective action problem: Olson, 1965), and the lack of impact of individual behavior is often used as a reason to refrain from acting (Heath & Gifford, 2002; Kaiser & Gutscher, 2003). In light of this, people's perception of their ability to manage risk together as a group becomes especially relevant (Chen, 2015; Homburg & Stolberg, 2006). Personal and collective efficacy beliefs and outcome expectancies have been found to have direct and distinct associations with climate change mitigation efforts (Bostrom et al., 2019).

Several psychological theories, such as the cognitive theory of stress (Lazarus & Folkman, 1984), the protection motivation theory (PMT) (Maddux & Rogers, 1983), and the extended parallel processing model (EPPM) (Witte, 1992), all highlight the role of efficacy beliefs (or related constructs) when facing threatening situations. In their recommendations for using fear appeals, Witte and Allen (2000) write that the effect of fear appeals is conditional on one's sense of efficacy and outcome expectancy. While threat perceptions determine whether people are motivated to act, perceived efficacy determines whether action is taken to reduce the threat (danger control) or to reduce their fear (fear control) (Maloney, Lapinski, & Witte, 2011). In line with this, some studies suggest that fear appeals can fail to be constructive, or that they might even be maladaptive, if not coupled with a sense of efficacy (Feinberg &

Willer, 2010; Maloney, Lapinski, & Witte, 2011; Witte & Allen, 2000), although findings have been mixed (Reser & Bradley, 2017; Tannenbaum et al., 2015). As a general feeling of worry is less intense than responses to messages aimed at inducing fear, negative effects are less likely in the former case. Still, following theories and research on fear appeals, the relationship between worry and behavior is likely to be stronger if worry is combined with a strong sense of efficacy (Dijkstra & Brosschot, 2003; Tannenbaum et al., 2015). People who are worried about climate change might be less likely to engage in climate change mitigation behavior if they do not think that they personally, or people collectively, can do something to reduce the risk.

Efficacy beliefs might play two roles in predicting climate change mitigation behavior: they might have a direct effect on behavior parallel to that of worry, and/or function as a moderator interacting with worry. Based on the work by Lubell (2002), the current project focuses on the role of four types of efficacy beliefs in predicting climate change mitigation behavior: personal efficacy, personal outcome expectancy, collective efficacy, and collective outcome expectancy. There is a specific focus on potential interactions between worry about climate change and the different efficacy constructs.

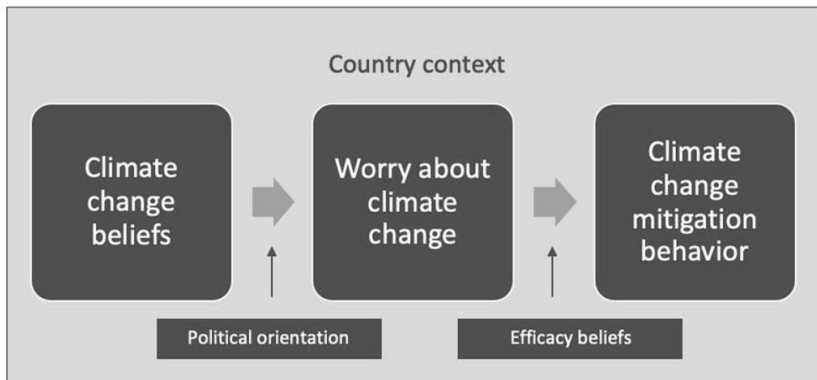
1.5 Purpose, aims, and research questions

The current project draws on theory and empirical findings from psychology and related disciplines, examining constructs ranging from beliefs to emotions and on to behavior. The overarching aim was to generate knowledge regarding climate change perceptions across European countries, with a specific focus on factors associated with worry about climate change. The project's main contribution lies in investigating conditions that alter the process from climate change beliefs to behavior. Specifically, the first two papers explore the role of political orientation in the relationship between climate change beliefs and worry (Paper I) and the role of personal and collective efficacy beliefs in the relationship between worry about climate change and energy-saving behaviors (Paper II). The third paper explores what people expect to be the

most important climate change impact on their country, and how this relates to individual risk judgments, including worry about climate change (Paper III).

Figure 1

An overview of the variables and relationships examined in the project.



2. Methodology

This chapter describes the research strategies, data, and analyses used to study public perceptions of climate change. It should be noted that due to the use of cross-sectional data throughout the project, the causality of the relationships cannot be established (see Section 4.2.1 for further discussion). All three papers included in the project have a between-subject design and are based on data from large international surveys, namely the European Social Survey (ESS) in Paper I and Paper II and the European Perceptions of Climate Change (EPCC) Project in Paper III. In addition to closed-ended survey questions, Paper III included responses to an open-ended question.

The datasets for both the ESS ($N = 44,387$) and EPCC ($N = 4,048$) include responses from a representative sample of the population aged 15 and above for the countries included in the surveys. This made it possible to focus on public perceptions across a particularly broad range of European countries. In some cases, survey weights were included to increase the representativeness of the results. Weights were not used in the multilevel models (Paper I and Paper II) to keep the models parsimonious and comparable, but they were used for all descriptive statistics and in the regular multiple regressions (Paper III). All analyses were conducted in STATA (version 15 - 17).

2.1 Participants and procedure

2.1.1 Paper I and Paper II: European Social Survey

Paper I and II used data from ESS Round 8 (European Social Survey, 2016a), which was fielded between August 2016 and December 2017. The interviews were conducted face-to-face and lasted about an hour. Strict random probability sampling was used when drawing respondents and the minimum target response rate was set to 70%. The response rate varied from 30.6% in Germany (lowest country response rate) to 74.4% in Israel (highest country response rate). The dataset includes responses from $N = 44,387$ respondents from 23 countries, including Austria, Belgium, the Czech Republic, Estonia, Finland, France, Germany, Hungary, Iceland, Ireland, Israel, Italy, Lithuania, the Netherlands, Norway, Poland, Portugal, the Russian Federation,

Slovenia, Spain, Sweden, Switzerland, and the United Kingdom. The mean age in the dataset (unweighted) was $M = 49.14$, with 47.38% men and 52.62% women.

A master version of the survey was developed in English and later translated to all languages used by more than 5% of the population in each country included in the survey. The translation was done following the TRAPD methodology (Translation, Review, Adjudication, Pretesting, and Documentation). Rigorous translation protocols were used to translate the questions. The translation guidelines used by each national team can be found in the published translation guidelines (European Social Survey, 2016b). The ESS study was approved by the ESS ERIC Research Ethics Committee (REC), which subscribes to the Declaration on Professional Ethics of the International Statistical Institute. All participants gave written informed consent to participate in the study. Consent was provided by the participant's legal guardian or next of kin if the respondent was 15 years old when the interview took place. More information about data collection procedures can be found in the documentation report (European Social Survey, 2017).

2.1.2 Paper III: European Perceptions of Climate Change

Paper III used data from the EPCC project, which was fielded in June 2016. $N = 4048$ respondents were surveyed via face-to-face interviews (UK, Germany, and France) or telephone interviews (Norway). The average time needed to complete the survey ranged between 22 minutes (in the UK) and 28 minutes (in France). The mean age in the dataset (unweighted) was $M = 47.96$, with 50.20% men and 49.80% women.

A master version of the survey was developed in English and translated to German, French, and Norwegian by two teams each of native speakers of these languages. The translations were later compared before a final version was agreed upon. The final version was then checked against the original English version. The EPCC project was approved by the Ethics Committee of the Cardiff University School of Psychology. Written informed consent to participate in the study was given by all participants.

2.2 Paper I

2.2.1 Materials

The items used in the analysis were part of the ESS core “Politics” module, as well as the module on “Climate Change and Energy”.

The dependent variable was worry about climate change, measured with the item ‘How worried are you about climate change?’ with response categories 1 (*Not at all worried*), 2 (*Not very worried*), 3 (*Somewhat worried*), 4 (*Very worried*), 5 (*Extremely worried*).

Climate change beliefs, assessed with two items, were used as independent variables. Beliefs about the causes of climate change were measured by asking ‘Do you think that climate change is caused by natural processes, human activity, or both?’, with answer categories 1 (*Entirely by natural processes*), 2 (*Mainly by natural processes*), 3 (*About equally by natural processes and human activity*), 4 (*Mainly by human activity*), or 5 (*Entirely by human activity*). Expectations about the severity of climate change impacts were assessed by asking ‘How good or bad do you think the impact of climate change will be on people across the world?’, with an 11-point response scale ranging from 0 (*Extremely bad*) to 10 (*Extremely good*).

Political orientation was included as a moderator and measured by asking respondents: “In politics people sometimes talk of ‘left’ and ‘right.’ Using this card, where would you place yourself on this scale, where 0 means the left and 10 means the right?”. The scale was labeled with numbers from 0 to 10.

Gender, age, and education were included as control variables.

2.2.2 Data analysis

Linear multilevel regression models (MLM) were used to account for possible variation between the 23 countries included in the models. We used two types of multilevel models to predict worry about climate change: random intercept models, where the regression coefficients were held constant across countries, while the

intercepts are allowed to vary; and a random slope model, where the relationship between political orientation and worry could vary between countries. The random slope model was used since the left-right scale used to measure political orientation can have somewhat different meanings across countries (Dalton, Farrell, & McAllister, 2011).

Four models were fitted: an unconditional null model, a random intercept model looking for direct effects, a random intercept model including the two interactions, and finally a random slope model to account for the differential effect of political orientation across countries. The models were estimated with maximum likelihood and compared with likelihood ratio tests.

The interactions between the two climate change beliefs and political orientation were assessed using the `margins` and `marginsplot` commands in Stata.

In the main models, all variables were grand-mean centered except the dichotomous gender and climate change impact variables. To estimate effect sizes, we fitted additional models with standardized versions of the variables and calculated the proportional reduction of variance (PRV) (Rabe-Hesketh & Skrondal, 2012). Standardization was avoided in the main models as it can influence the interpretation of variance (Hox, Moerbeek, & Van de Schoot, 2017). Listwise deletion was used in all models, so that all four models have the same number of respondents ($N = 35,690$).

2.3 Paper II

2.3.1 Materials

The items employed for the analyses in Paper II were part of the ESS ‘Politics’ and ‘Climate Change and Energy’ modules (see above).

Energy-saving behaviors were treated as dependent variables, which in turn were measured with two distinct items. Energy curtailment behaviors were measured with the question ‘There are some things that can be done to reduce energy use, such as switching off appliances that are not being used, walking for short journeys, or only

using the heating or air conditioning when really needed. In your daily life, how often do you do things to reduce your energy use?', with response categories 1 (*Never*), 2 (*Hardly ever*), 3 (*Sometimes*), 4 (*Often*), 5 (*Very often*), and 6 (*Always*). Energy efficiency behaviors were measured with the question 'If you were to buy a large electrical appliance for your home, how likely is it that you would buy one of the most energy efficient ones?', measured on a scale from 0 (*Not likely at all*) to 10 (*Extremely likely*).

Worry about climate change was treated as the independent variable in the analyses; for the exact item wording, see the description of the materials in Paper I (see Section 2.2.1).

Personal efficacy was measured with the question 'Overall, how confident are you that you could use less energy than you do now?', with a response scale ranging from 0 (*Not at all confident*) to 10 (*Completely confident*). Personal outcome expectancy was measured with the question 'How likely do you think it is that limiting your own energy use would help reduce climate change?'. Collective efficacy was measured with the question 'How likely do you think it is that large numbers of people will actually limit their energy use to try to reduce climate change?', and collective outcome expectancy with the question 'Now imagine that large numbers of people limited their energy use. How likely do you think it is that this would reduce climate change?'. The items on personal outcome expectancy, collective efficacy, and collective outcome expectancy were answered on a scale from 0 (*Not at all likely*) to 10 (*Extremely likely*).

Climate change beliefs and political orientation (see Section 2.2.1), as well as gender, age, education, and household income, were included as control variables in the analyses.

2.3.2 Data analysis

Six random-intercept models were fitted: three predicting energy curtailment behaviors and three predicting energy efficiency behaviors. An unconditional null model was followed by a random-intercept model looking at direct effects, and then

by a model adding four interaction terms. The models were compared with likelihood ratio tests after estimating them with maximum likelihood.

The `margins` and `marginsplot` commands were used to interpret the four interaction effects between worry about climate change and personal efficacy, worry about climate change and personal outcome expectancy, worry about climate change and collective efficacy, and worry about climate change and collective outcome expectancy.

Gender and climate change consequences were dichotomous; all other variables were treated as continuous and grand-mean centered in the main models. Effect sizes were estimated by additional models with standardized versions of the variables as well as with PRV.

2.4 Paper III

2.4.1 Materials

The main variables in Paper III were based on the open-ended question: “Climate change may affect different countries in different ways. What do you think will be the most important effect of climate change on [France/Germany/Norway/the UK]?”. The question ending corresponded to the country in which the respondent lived. An open-ended survey question allowed the respondents to provide their immediate and subjective associations.

Two forms of individual risk judgments were included as dependent variables. Worry about climate change was measured as ‘How worried, if at all, are you about climate change?’, with response categories 1 (*Not at all worried*), 2 (*Not very worried*), 3 (*Fairly worried*), 4 (*Very worried*), 5 (*Extremely worried*). Risk evaluation was measured with the item ‘Overall, how positive or negative do you think the effects of climate change will be on [France/Germany/Norway/the UK]?’, with response categories 1 (*Entirely positive*), 2 (*More positive than negative*), 3 (*Neither positive nor negative*), 4 (*More negative than positive*) and 5 (*Entirely negative*).

Political orientation, measured with the left-right scale as in the ESS, as well as gender (dichotomous), and age (in 10-year intervals) were included as control variables.

2.4.2 Data analysis

Each response to the open-ended question about expected climate change impacts was sorted into the following six categories by two native speakers of each country's language: (1) changes in attitudes, motives, and goals; (2) changes in actions and activities; (3) emissions and pollution; (4) environmental changes; (5) impacts on humans; and (6) hardly any impacts. The answers were sorted into sub-categories in instances where further differentiation was relevant. For example, the category reflecting expected changes to 'actions and activities' included one sub-category reflecting expected changes to climate change mitigation actions and one sub-category reflecting expected changes to climate change adaptation actions. In cases where more than one category was mentioned by the respondent, an answer was sorted into several categories.

The first five categories were based on a multi-level framework by Böhm and Pfister (2001)⁸, developed to describe perceptions of global change events. According to the framework, environmental risks can be seen as a circular causal chain spanning from changes in human attitudes, motives and goals to impacts on humans, and then back to attitudes, motives and goals. This theory-driven approach was considered a good first step due to the limited research on expected impacts of global change events based on narrow open-ended questions. The sixth category (hardly any impacts) was used for answers reflecting beliefs that climate change will have insignificant or no consequences on one's country, such as "nothing will change". In addition to descriptive analyses investigating how often the different categories were mentioned within each country, three sets of regression analyses were conducted.

The dataset was merged across countries for all regression analyses. First, the likelihood of mentioning each of the above-mentioned categories was predicted by gender, age, and political orientation. This was done by fitting six logistic regression

⁸ The five levels in the causal risk chain are based on Hohenemser, Kasperson, and Kates (1985).

models, one for each category. Country was included as a control variable in all models. Second, the relationship between mentioning each of the six categories on the one hand and individual risk judgments (worry and risk evaluation) on the other was investigated with two multiple regressions, one for each outcome. Gender, age, political orientation, and country were included as control variables. Third, two multiple regressions were run to test the association between worry or risk evaluation and mentioning several categories (width) or giving more specific answers (depth) in the open response. The width variable was calculated by summing the number of categories mentioned (1 – 5), while the depth variable was based on whether answers could be sorted into a sub-category, indicating more specific responses. Gender, age, political orientation, and country were included as control variables.

3. Empirical findings

3.1 Paper I

The results of Paper I support a relationship between beliefs about the causes and consequences of climate change and worry about climate change. Worry was positively associated both with a stronger belief in the anthropogenic nature of climate change and with believing in more negative climate change impacts. The strongest direct effect was that of belief in anthropogenic climate change.

The moderation analyses supported that the relationship between climate change beliefs and worry about climate change was moderated by political orientation. This was true both for belief in anthropogenic causes and belief in negative consequences. Although the association between climate change beliefs and worry was positive independently of placement on the political scale, the strength of these relationships differed by political orientation. The relationship was strongest for those placing themselves furthest left on the political spectrum, followed by those in the center, and weakest for those furthest to the right. Political orientation had a significant direct association with climate change worry before, but not after, including the interaction in the model. The strength and direction of the relationship between political orientation and worry differed between the 23 countries; although the relationship was negative in most countries, this was not the case in Italy and some post-communist countries.

The results supported that individual-level worry about climate change is associated with the country context; about 6% of the variation in worry could be attributed to the country level when no other variables were included in the model. Age did not have a statistically significant effect on worry. Higher levels of education were related to increased worry and women were more worried than men.

3.2 Paper II

The results of Paper II support a positive relationship between worry about climate change and two types of personal energy-saving behaviors: energy curtailment – and energy efficiency. Of the included variables, worry was one of the strongest predictors for both types of energy-saving behaviors. Still, according to effect size measures, the independent contribution of worry was only about 3% for curtailment behaviors and 2% for energy efficiency behaviors.

Higher levels of personal efficacy, personal outcome expectancy, and collective outcome expectancy were associated with both types of energy-saving behaviors. Collective efficacy was not related to either of the outcomes. Medium and high worry about climate change was more closely related to energy curtailment behaviors for those scoring high on personal or collective outcome expectancy, and more closely related to energy efficiency behaviors for those scoring high on collective outcome expectancy. There was no difference in energy-saving behaviors between those with high versus low levels of outcome expectancy among individuals who were not at all worried about climate change.

Paper II supported that reported individual-level energy curtailment and efficiency behaviors were somewhat related to the country context. 3% of the variation in energy curtailment behaviors and 6% of the variation in energy efficiency behaviors were explained at the country level. Beliefs about climate change causes and consequences, political orientation, age, gender, education, and income were also included in the models. Energy curtailment was more likely among women, older individuals, and those with higher levels of education, a lower household income, and a left-leaning political orientation. Energy curtailment was negatively related to belief in anthropogenic causes of climate change. Energy efficiency behavior was more likely among those believing in negative climate change impacts, older individuals, women, and those with higher household income and education.

3.3 Paper III

The results of Paper III showed that people across all four countries included in the survey first and foremost associate climate change consequences with impacts that can be categorized as environmental changes (Level 4). This category included responses mentioning, for example, temperature changes, seasonal and weather changes, natural disasters, and impacts on animals or plants. The number of respondents mentioning Level 4 ranged from 61% of responses in the UK to 86% in Norway and France and 87% in Germany. The frequency order of the remaining five categories differed across countries. All six categories were mentioned in each of the countries, albeit some very seldom.

The six impact categories had somewhat different associations with the two risk judgments. For example, expecting the most important climate change consequence to be environmental changes (Level 4) or impacts on humans (Level 5) was related to an increase in both worry about climate change and belief in more negative effects of climate change on one's own country. However, expecting that climate change will lead to changes in action and activities (Level 2) was not related to either of the risk judgments. The two outcomes differed with regard to their associations with the number of consequences mentioned in a response (width) and the specificity of the mentioned consequences (depth). Although both width and depth were related to worry about climate change, they were not related to cognitive risk evaluation.

Paper III again supported some variation in perceptions of climate change consequences between demographic groups. However, this first and foremost applied to responses sorted into Category 6; men, those in the oldest age groups (55 – 64 and 65 +), and those placing themselves further right on the political spectrum were more likely to expect few or no consequences of climate change.

4. Discussion

In this section, the findings of the three papers included in the project are discussed in relation to the overall research objectives as well as methodological considerations, theoretical and practical implications, ethical considerations, and suggested directions for future research.

4.1 Theoretical implications

4.1.1 Climate change beliefs and worry about climate change

In line with previous research (e.g., Lee et al., 2015), beliefs in anthropogenic causes of climate change were found to be the strongest predictor of worry. To what degree a phenomenon is seen as risky can depend on perceptions of the degree to which undesired consequences can be reduced or stopped by either modifying the cause or softening the damage of the impact (Appelbaum, 1977). One could argue that human-caused events should be seen as more controllable than those with natural causes and therefore perceived as less of a risk. On the other side, a human cause might increase distress because it is apparent that the problem will not solve itself and that it could have been avoided. In line with this, climate change might be seen as “controllable” in that humans are collectively responsible for it, but as an “uncontrollable” risk in the sense that halting or reducing its damage is perceived to be outside the control of individuals. In the 2021 APA report on climate change and mental health, Van Susteren writes that “When disasters are experienced as entirely ‘accidental’, healing from the injuries or losses is less arduous. With disasters due to human error, carelessness, or negligence, healing is dramatically encumbered by the knowledge that the disasters could have been averted” (Clayton et al., 2021, p. 32).

Previous research has found that people see human-caused hazards as more of a risk, even when the impacts of human-caused and natural-caused hazards are presented as identical (Siegrist & Sütterlin, 2014). People tend to prefer being harmed in naturally caused – as compared to human-caused - accidents and perceive them as less dangerous and scary (Rudski, Osei, Jacobson, & Lynch, 2011). Siegrist and Sütterlin

(2014) propose that one reason might be that natural and human-caused hazards are related to different risk characteristics, such as perceived dread and uncertainty (see the psychometric paradigm; [Fischhoff, Slovic, Lichtenstein, Read, & Combs, 1978; Slovic, 1987]). In addition to these psychometric characteristics, thinking that an action or technology is ‘tampering with nature’ is related to higher perceived risk (Sjöberg, 2000), which is arguably the case with anthropogenic climate change.

Another explanation for the relationship between belief in human causes and worry is that beliefs about causes are one component of a broader belief system or mental model of climate change, and that it is the model as a whole that is related to worry.

In consequentialist risk frameworks, perceptions of severity and probability are seen as core components of risk assessment (Loewenstein et al., 2001). The survey question asking about beliefs about how good or bad the impact of climate change will be on people across the world first and foremost deals with severity. Adding a predictor reflecting the expected likelihood of negative impacts could have increased the model’s explained variance. However, according to the risk-as-feelings hypothesis, changes in probability are of less relevance for emotional reactions, such as worry, than they are for cognitive evaluations of risk (Loewenstein et al., 2001). A more important weakness might be that the question does not account for the perceived spatial or temporal distance of climate change impacts (Van Valkengoed et al., 2021).

In addition to beliefs in human causes (attribution skepticism) and negative consequences (impact skepticism) of climate change, a third belief is often included when talking about climate change beliefs, namely beliefs about whether climate change is happening at all (trend skepticism) (see e.g., Poortinga et al., 2011; Van Valkengoed et al., 2021). Trend skepticism is not included in the current project as few people now question whether climate change is real (Poortinga et al., 2018; Steentjes et al., 2017). However, some have highlighted another aspect of climate change beliefs: skepticism regarding the effectiveness of mitigation efforts (response skepticism) (Capstick & Pidgeon, 2014). Capstick and Pidgeon (2014) report that response skepticism is more strongly related to climate change concerns than

skepticism regarding the factual basis of climate change. Response skepticism shares similarities with the personal and collective efficacy beliefs included in Paper II. Consequently, efficacy beliefs and related constructs are likely not only relevant for the relationship between climate change worry and climate change mitigation behaviors, but also for predicting worry.

Although the relationship between climate change beliefs and worry was positive across the political spectrum, it was strongest for left-leaning individuals. The results are consistent with the expectation that political orientation can alter how climate change beliefs relate to worry (see Section 1.4.2). In line with the notions of motivated reasoning (Kunda, 1990) and cultural cognition (Kahan, 2012), this might be because people's ideology functions as a filter to help them avoid an uncomfortable dissonance between climate change concerns and their preferred way of life. When looking at interactions between climate change beliefs and political orientation, political orientation is used as a proxy for worldviews. A preference for individualistic versus egalitarian worldviews (Kahan, 2012) can function as a motivation to filter and emphasize information in a certain way. For example, individualistic versus egalitarian worldviews might be especially relevant with regard to the relationship between expecting spatially distant climate change impacts and climate change worry.

Hamilton et al. (2020) argue that political orientation and climate change beliefs might both be proxies for the latent variable 'political identity', drawing upon findings from the US. A large amount of shared variance makes it difficult to interpret results when the related variables are a part of the same multiple regression or included together in an interaction. Findings from the current project show that political orientation measured with the left-right scale does not have the same effect on worry across all countries, and the effects of political orientation on climate change perceptions are generally weaker in Europe compared to those previously found in the US. Such country differences are in line with more recent research (Czarnek, Kossowska, & Szwed, 2021). Hornsey et al. (2018) report that the relationship is stronger in countries with large fossil fuel industries and countries with high per-capita emissions. They suggest that one reason for cross-country differences is that right-leaning ideologies

are not inherently linked to climate skepticism. Instead, the entanglement of fossil fuel industries in the economy and required lifestyle changes (the vested interest in resisting change) drive the effect of ideology in some countries. Future research could look at other ideological or value-based variables - other than a scale differentiating between left and right or progressive and conservative - that might be more relevant outside the US and Western countries.

Druckman and McGrath (2019) and Bayes and Druckman (2021) further suggest differentiating between accuracy motivation (which has the goal of arriving at a correct conclusion) and directional motivation (which has the goal of arriving at a predetermined conclusion) when investigating motivated reasoning. This is relevant because the motivation to filter information in a certain way affects whether prior climate change beliefs influence the information updating process. The alternative is that the information updating process instead depends on the information sources that are trusted by a political group (e.g., scientists versus party leaders). Bayes and Druckman (2021) conclude that previous research is somewhat unclear with regard to which of these processes people use to form beliefs. Because this is highly relevant for communication and to avoid further polarization, future research should aim to disentangle the exact process.

4.1.2 Worry about climate change and climate change mitigation behavior

Although worry was a clear predictor of the two energy-saving behaviors, both in terms of statistical significance and in comparison with the other predictors, the effect size was not very large. This is in line with previous findings on the relationship between attitudes and reported pro-environmental behavior (e.g. Kollmuss & Agyeman, 2002). There are several potential explanations for the relatively weak relationship between worry and (energy) behaviors (for an overview, see Gifford, 2011; Kollmuss & Agyeman, 2002). One is that the relationship is conditional on additional factors not included in the model. In the PMT, which is a part of the theoretical background for Paper II, the coping appraisal pathway includes the concept of response costs (the cost associated with conducting a behavior) in addition to the

concepts of personal efficacy and outcome expectancy (Rogers, 1983). Both high- and low-impact pro-environmental behaviors are related to perceived cost or effort (Cologna et al., 2022). Perceived (psychological or economic) cost can help explain why pro-environmental attitudes are more closely related to low-cost than high-cost behaviors (Farjam, Nikolaychuk, & Bravo, 2019). For example, pro-environmental attitudes have been found to relate to household behaviors, but not air travel (Alcock et al., 2017).

The question about perceived cost is interesting in relation to energy-saving behaviors because efficiency behaviors have a large one-time economic cost, but high long-time economic benefits. Furthermore, the perceived ‘costliness’ of an investment arguably depends on a person’s economic situation. One could argue that curtailment behaviors have a high behavioral cost given the need to regularly repeat these behaviors.

Interestingly, in addition to perceived cost decreasing the likelihood of engaging in a behavior, there is also support for the opposite effect; that green products with a *higher* cost yield more pro-environmental consumption because they indicate status (Griskevicius, Tybur, & Van den Bergh, 2010). This is especially relevant with regard to energy efficiency behaviors, where an energy-efficient fridge or washing machine is generally more expensive. Future research on energy-saving behaviors could include perceived cost in addition to worry and efficacy beliefs.

The strength of the relationship between worry about climate change and energy-saving behaviors might also be influenced by what and who people worry about, which cannot be answered with the data used in this project. According to the risk-as-feelings hypothesis, emotions play a larger role when a risk decision is made for oneself compared to a risk decision made on behalf of other people (Loewenstein et al., 2001). Following this, worry about climate change might be more closely related to energy-saving behaviors among people who see climate change as a personal risk rather than a risk mainly affecting others.

Although high levels of worry were more strongly related to energy-saving behaviors when combined with positive outcome expectancies, the positive relationships did not

disappear even when efficacy beliefs were low. This contrasts with the usual interpretation of many traditional threat theories (for an overview, see Hornsey et al., 2015), where a perceived threat is not thought to be motivational unless it is combined with positive coping appraisals that can buffer against the threat. One important difference between fear theories such as the PMT and EPPM and the current research is the former's emphasis on fear (appeals) rather than worry. Furthermore, several of these theories originally focused on explaining individual (health) behaviors (Maloney et al., 2011; Witte & Allen, 2000), which are arguably quite different from the collective and global threat of climate change (Reser & Bradley, 2017). More recent models employing a social identity perspective imply that climate change threat appraisals are motivating (collective) action rather than leading to avoidance and a loss of motivation (for a review, see Masson & Fritsche, 2021).

Positive correlations between worry about climate change and all four of the measured efficacy beliefs were found in Paper II. In line with results reported by Angill-Williams and Davis (2021), the correlation was stronger for (personal and collective) outcome expectancies than for (personal and collective) efficacy beliefs. Positive relationships between worry and efficacy beliefs have been established in several previous studies (e.g., Angill-Williams & Davis, 2021; Hornsey et al., 2015; Milfont, 2012). Hornsey et al. (2015) suggest that one explanation is that perceptions of high risk can lead to (motivated) perceptions of control that help buffer against helplessness. In support of this, they found that participants who read high-threat messages related to climate change reported higher levels of collective efficacy than participants in the low-threat condition. Even though the relationship with worry was positive for all four types of efficacy beliefs, motivated control might be especially relevant with regard to collective efficacy. The perceived lack of control at the individual level might translate into a stronger belief in the effectiveness of collective action (Fritsche et al., 2017). Another explanation for the positive relationships between worry and efficacy beliefs is that strong efficacy beliefs 'enable' higher worry because they reduce avoidance or denial.

Worry, which indicates at minimum awareness of the climate issue, might be a requirement to motivate intentional behavior aimed at reducing the threat. In line with assumptions from the EPPM (Witte, 1992), the interactions showed that outcome expectancies were not related to energy-saving behaviors without a certain level of worry. Strong efficacy beliefs might in fact be a reason not to act, because efficacy without worry might indicate that people think the threat can be relatively easily handled. Angill-Williams and Davis (2021) found that video messages highlighting the effectiveness of individual or collective action increased self-reported outcome expectancy, but did not translate into pro-environmental behavioral intentions. They propose that this might be due to a ‘freeloader’ effect or a complacency effect (see Hornsey & Fielding, 2016) and that positive messages alone might reduce the perceived threat and necessity to act. Such effects might also explain why we do not find a direct effect of collective efficacy on energy-saving behaviors. Previous studies using somewhat different operationalizations of the efficacy constructs also reported small or no effects of collective efficacy (Bostrom et al., 2019; Doherty & Webler, 2016). Hamann and Reese (2020) even found collective efficacy to be negatively related to pro-environmental behavior in some instances, and propose that the reason is that collective efficacy is associated with a lower perceived necessity to take personal responsibility.

Personal efficacy, personal outcome expectancy, and collective outcome expectancy all had direct effects on energy-saving behaviors. The strongest direct effect was between personal efficacy and energy efficiency behaviors. Verschoor and colleagues (2020) conducted a network analysis using the ESS dataset and reported that personal efficacy was not related to any of the other forms of efficacy beliefs. Moreover, previous research has found personal efficacy to be a less consistent latent construct compared to other efficacy measures (Bostrom et al., 2019). Consequently, the measure of personal efficacy included in the current project might reflect different underlying factors than the other efficacy measurements.

Beliefs about the causes and consequences of climate change have previously been found to predict both pro-environmental intentions and behavior (Hornsey et al.,

2016), preparedness to act (Aitken, Chapman, & McClure, 2011), and energy conservation (Clement et al., 2014). The results of Paper II show that belief in negative consequences was positively related to efficiency behavior, but not related to energy curtailment behavior. Beliefs about human causes were not related to efficiency and had negative effects on curtailment. Although the negative effect seems surprising, this was also reported by Gaspar and Antunes (2011) with regard to considering energy consumption when buying electrical appliances. The reason for the effect might be that high environmental concern is generally related to high income and education, making savings-motivated curtailment less of a consideration in this group.

More recent research by Van Valkengoed, Perlaviciute, and Steg (2022) reported a positive relationship between climate change beliefs (climate change is real, human-caused, and will have negative consequences) and the likelihood of seeking out information about climate change adaptation as well as supporting adaptation policies. However, the relationship was less clear with regard to reported or intended adaptation behaviors, such as insulating one's home or installing a green roof. While some adaptation actions were related to climate change beliefs, others were not (Van Valkengoed, et al., 2022).

One explanation for the inconsistent effects of climate change beliefs is that beliefs are not enough to motivate (energy-saving) behavior. People's beliefs about the causes of climate change are thought to be relevant for what kind of efforts they think would be effective in mitigating climate change, but are themselves not enough to initiate action (Wolf & Moser, 2011). Instead, the relationships between climate change beliefs and energy-saving behaviors are likely mediated by factors such as climate change worry, moral sentiments (Zawadzki, Bouman, Steg, Bojarskich, & Druen, 2020), and perceived responsibility for taking action to mitigate climate change (Bateman & O'Connor, 2016). These indirect relationships between climate change beliefs and climate change mitigation actions should be examined more in the future.

Political orientation was not investigated as a potential moderator of the relationship between worry and energy-saving behaviors. However, research does indicate possible interactions between political orientation and emotions such as hope and fear (Feldman & Hart, 2018), with these emotions having a stronger effect on support for climate policies for conservatives compared to liberals in the US. Furthermore, right-leaning and left-leaning individuals might differ in *what* they worry about with regard to climate change, and the content of their worry might influence its relationship with energy-saving behaviors. Political orientation also likely influences *which types* of climate change mitigation behaviors are preferred by those who are worried. Worldviews are also likely to affect perceptions of personal responsibility for global issues such as climate change, which is relevant because energy-saving behaviors are predicted by perceived personal responsibility (Bouman et al., 2020). Finally, as people's sense of collective efficacy can depend on the group(s) to which they belong (Mackay, Schmitt, Lutz, & Mendel, 2021), future research could look further into how political orientation interacts with collective efficacy in explaining both climate change worry and behavior.

One potential critique of the current project, as well as a large amount of psychological research in general, is the excessive focus on individual consumer behavior. Previous research has identified a large number of unique pro-environmental behaviors (Markle, 2013), and future research could examine how worry and efficacy beliefs are related to different types of behaviors. Future research could also continue to expand its scope to include the range of different roles individuals can play in climate change mitigation (Nielsen, Nicholas, Creutzig, Dietz, & Stern, 2021).

For demand-side measures to drastically reduce emissions, changes in lifestyle and behaviors need to be supported by changes in infrastructure, policy, and technological developments (IPCC, 2022b). Important contextual factors were not included in the current project, such as external constraints (e.g. Whittle, Haggar, Whitmarsh, Morgan, & Xenias, 2019), perceived external pressure, health and safety impacts (Truelove & Gillis, 2018), and norms and habits (Lundberg et al., 2019).

4.1.3 Expected climate change impacts

Psychological distance is seen as a key barrier for taking action toward climate change mitigation (Van Lange & Huckelba, 2021). While Paper I and Paper II include survey questions on how good or bad the impacts of climate change will be on people across the world, Paper III gives important insight into beliefs about more proximal impacts. A majority of people in the Western European countries included in the sample believe that the most important climate change consequences on their country will be environmental changes, such as more extreme weather; see Böhm and Pfister (2001) for similar findings. Bouman et al. (2020) emphasize that worry indicates that a person “is actively and emotionally engaged with the topic of climate change and feels personally bothered by its consequences” (p. 2). Although a positive relationship between expectations of environmental changes and worry was established, the association of climate change impacts with environmental changes first and foremost might be one explanation for why the level of worry is quite moderate among the general public.

Although geographical distance is somewhat accounted for by asking about people’s perception of climate change impacts on their own country, other aspects of psychological distance (Spence et al., 2012), such as perceived social, temporal, or hypothetical distance might still be high. Future research can complement the current findings by asking more specific open-ended (e.g., ‘What will be the most important impact of climate change on your life?’) and closed-ended questions (e.g., ‘How negative will the impacts of climate change be for you personally?’). More specific questions might yield stronger associations between impact beliefs and climate change worry.

Which of the six impact categories -- (1) changes in attitudes, motives, and goals; (2) changes in actions and activities; (3) emissions and pollution; (4) environmental changes; (5) impacts on humans; and/or (6) hardly any impacts -- respondents mentioned in their response is relevant because it can reflect to what extent people think the impact of climate change is avoidable, what could be done to mitigate or adapt to it and who is responsible for it (Böhm & Pfister, 2001). If people see

environmental impacts as the most important effect on their country, they are likely to consider efforts aimed at this level as the most efficient and worthwhile. Böhm and Pfister (2001) write that people tend to construct short causal chains. Emissions and pollution (Level 3) are most likely seen as the cause if environmental changes (Level 4) are seen as the most important consequence. Since the possibility to intervene lies between these levels, technologies that reduce or stop emissions and pollution (e.g., CCS) might be seen as a solution. On the other hand, people might be less open to support efforts targeting changes in human actions and activities (Level 2) because the causal relationship is less clear to them; human actions and activities are not seen as part of the risk.

Böhm and Pfister (2001) draw upon the mental model literature when developing their framework. Focusing on climate change, studies in this vein have established that laypeople often hold faulty beliefs about the causes and consequences of climate change (Bostrom, Morgan, Fischhoff, & Read, 1994; Kempton, 1997; Moxnes & Saisel, 2009; Reynolds, Bostrom, Read, & Morgan, 2010; Sterman, 2008). For example, people might confuse climate change with the weather or with other environmental issues such as plastic pollution or air pollution. The current project does not differentiate between ‘correct’ or ‘incorrect’ mental models of climate change impacts. The relationship between the six categories and climate change worry could be different if sub-categories accounted for how people’s impact associations differed from expert assessments. The relationships would likely also differ if impacts perceived as ‘positive’, ‘negative’ or ‘neutral’ were separated out, for example by following an affective image approach (e.g., Smith & Leiserowitz, 2012). Certain climate change impacts might in fact be seen as positive, such as increased agricultural productivity in high latitude regions (IPCC, 2022a).

Our approach of sorting the answers into pre-defined categories based on the multi-level framework by Böhm and Pfister (2001) is only one of many possible ways to analyze the open-ended responses. Recent research has identified certain climate change impact framings as especially promising for motivating climate engagement. These include highlighting negative impacts on health (Roser-Renouf & Maibach,

2018) and on human cultures (such as cultural heritage and diversity) (Tam, Leung, & Koh, 2022). Future research could also consider other categorizations, such as categories based on typical or effective communicative framings⁹.

In line with the risks-as-feelings hypothesis (Loewenstein et al., 2001), Paper III finds that the emotional risk reaction (worry about climate change) differs from the cognitive evaluation of risk (beliefs about the severity of climate change on one's own country). One theoretical difference between the two reactions is that emotional reactions depend on factors such as how vividly one can imagine a consequence, as well as the expected interval between one's reaction to a threat and the outcome of the reaction (Loewenstein et al., 2001). This could help explain why the width (number of levels mentioned) and depth (how specific the answers were) of the open-ended responses was only related to worry and not to cognitive evaluations. The vividness of different climate change impacts could be investigated further.

4.1.4 Country context

Our findings support that the country in which people live is related to what they see as the most important climate change consequence, how worried they are, to what degree political orientation is associated with worry, and how likely they are to report energy curtailment and efficiency behaviors. Still, the overall effect of the country context appears to be relatively small. This should point us towards (also) investigating other 'levels' that can help explain differences in climate change worry. While cross-national comparisons are relatively frequent within the quantitative risk literature (see e.g. Renn & Rohrman, 2000), differences between regions, municipalities, or cities have received less attention. Controlling for differences between smaller geographical units might be appropriate because the country level encompasses a range of different experiences and vulnerabilities. Previous research has found that beliefs about climate change impacts are related to experiences of past and current weather and climate events (Shaffer & Naiene, 2011), which can differ

⁹ Other potential approaches to analyzing the open-ended responses include using methods such as natural language processing. One reason why categorization was chosen rather than methods such as natural language processing was the fact that the responses were in four different languages.

substantially within a country depending on factors such as closeness to the water, elevation, or the shape of the land. Different regions might differ substantially in their vulnerability and concern, and research from the US shows that people living in different states worry about different types of extreme weather events (Kim, Ballew, Lacroix, Leiserowitz, & Marlon, 2020).

Rather than solely controlling for country differences in the intercepts, Paper I also accounts for differences in slopes between political orientation and worry. Recent research by Noll, Filatova, Need, and Taberna (2022) indicates that social and cultural differences between countries might also influence the relationship between outcome expectancies and household climate change adaptation. On the other hand, the effects of worry, climate change beliefs, and personal efficacy were found to be relatively similar across the countries included in their study. Future research could investigate cross-country differences in the strength or direction of the established relationships further.

It is important to note that our findings cannot be generalized outside the European context. Some of the findings might be different in other parts of the world, such as those regarding what people think of as the most important impacts of climate change. Lee et al. (2015) report that climate change risk perception is particularly related to dissatisfaction with air and water quality in China, where these issues are severe and sometimes confused with climate change. Results by both Mahl, Guenther, Schäfer, Meyer, and Siegen (2020) and Shaffer and Naiene (2011) indicate that other types of climate change consequences might be emphasized in Africa. Furthermore, both the role and strength of personal and collective efficacy beliefs might be influenced by living in an individualistic versus collectivistic culture (Klassen, 2004).

4.2 Methodological considerations

The goal of this section is to reflect upon methodological considerations related to the current project.

4.2.1 Causality

Cross-sectional surveys make it possible to study the prevalence of variables of interest, such as worry about climate change, among a large number of people and investigate relevant associations between the variables. The downside is that causal relationships cannot be established; since all data were collected at the same point in time, we cannot know which variable imposes the change. Although research questions may be based on theoretical frameworks implying a causal relationship, the results of the current project cannot support causal assumptions.

A causal relationship from climate change beliefs to worry is supported by several theoretical frameworks, including the risk-as-feelings hypothesis (Loewenstein et al., 2001). However, there is also support for a relationship between beliefs and emotion in the other direction, that emotion can influence both the content and strength of beliefs (2000). In line with this, the risk-as-feelings hypothesis also acknowledges that emotional reactions such as worry can influence cognition (Loewenstein et al., 2001). Wong-Parodi and Feygina (2021) suggest that communication interventions aimed at enhancing people's climate change-related emotions might be a way of increasing climate change acceptance across the ideological spectrum.

The current project follows the theoretical assumption that worry and efficacy beliefs increase the likelihood of taking action against a risk (e.g., Rogers, 1975). However, findings by Nauges and Wheeler (2017) also support a relationship in the opposite direction: that energy-efficiency behaviors might lead to reduced concern. Taking action against climate change is typically recommended as a way to reduce climate distress by increasing people's sense of efficacy (Clayton et al., 2021). Another relevant question is how climate change worry and efficacy beliefs might be affected when people are prevented from taking action. For example, people who are merely renting a residence are likely not able to insulate their homes or buy efficient household appliances. This is also relevant with regard to people required to travel by airplane for work purposes or don't have vegetarian options to choose from in their work or school cafeteria. It is well known that (avoided) behavior can influence attitudes, for example in the case of cognitive dissonance (Festinger, 1957). In

addition to attitude- or behavior change, dissonance can be reduced through trivialization (Fointiat, 2011) or denying responsibility (Gosling, Denizeau, & Oberlé, 2006). Although there is reason to believe that worry increases the likelihood of climate change mitigation behavior, taking or avoiding climate change mitigation behaviors might also influence people's level of worry.

There have further been calls for more research on the long-term effects of emotions like worry (Chapman et al., 2017), and on the causal effects of inducing affective states (Brosch, 2021). Even though climate change worry seems to motivate climate action in the short term, a better understanding of its positive and negative long-term effects on motivation and health is needed. Future research could extend the current findings by introducing bidirectional relationships between climate change beliefs, worry, and climate change mitigation behavior, as well as testing the established relationships using experiments and longitudinal methods.

4.2.2 Validity

In line with most previous research focusing on environmental attitudes and behaviors (Lange & Dewitte, 2019), the data used in the current project is based solely on self-reports. One issue with self-reported behavior measures is that they can induce issues of response bias. For example, the clear skew of curtailment- and efficiency behaviors reported in Paper II could be due to socially desirable responses, the tendency for respondents to indicate a behavioral frequency that is viewed more favorably (Edwards, 1957). Because both the ESS and the EPCC are based on face-to-face interviews (in most countries), it is especially relevant to consider whether the mere presence of another person, as well as their facial expressions or tone of voice, might further influence responses. However, the problem of social desirability might not be too large; Milfont (2009) found no such effects with regard to self-reported environmental behaviors. Vesely and Klöckner (2020) reported generally small correlations, but substantial heterogeneity across the included studies. Research looking specifically at energy consumption, which is the focus of Paper II, has also found self-reports to be relatively accurate (Warriner, McDougall, & Claxton, 1984).

The accuracy of self-reports can also be influenced by the length of the survey, and both the ESS and the EPSS surveys are quite long (see Section 2.1 and Section 2.2). Respondent fatigue is likely to occur if respondents get tired or bored during a long survey, and it can lead to decreased data quality for questions asked later in the survey. Respondent fatigue increases the likelihood of choosing the ‘don’t know’ option, answering in a pattern that requires less effort, skipping questions, or ending the questionnaire altogether (Lavrakas, 2008b).

To avoid respondent fatigue, surveys may rely upon single-item measures of constructs, as is the case in the current project. Single-item measures have several advantages: they are short and flexible, easy to administer and complete, and less time-consuming (Fuchs & Diamantopoulos, 2009). Still, the use of single-item measures can be problematic. Using single questions to tap into a respondent’s age, gender or income is not problematic, as the true value can be captured by asking about it directly. However, it might be an issue when measuring energy-saving behaviors, because several different types of curtailment behaviors and efficiency behaviors are clustered together. For example, walking for short journeys or adjusting the thermostat (both curtailment behaviors) might have somewhat different predictors. In line with this, research has found that transportation behaviors differ from actions taken at home (Poortinga, Steg, Vlek, & Wiersma, 2003). Future research should consider whether and when more than one question is needed to identify and differentiate between important facets.

Climate change worry was also measured with one question in the current project (‘How worried are you about climate change?’). Single items are frequently used within the emotion literature (Weidman, Steckler, & Tracy, 2017). One potential issue is that theoretically important cognitive and affective aspects of worry might not be a part of laypeople’s understanding of the concept. For example, rather than capturing the repeated negative thoughts about climate change reflecting the concept of worry (Borkovec et al., 1983), a single item asking about people’s level of climate change worry might instead capture their general attitude arising at the time the question is asked, aligning more with the definition of concern (Fransson & Gärling, 1999).

Possible issues with how respondents interpret survey questions are especially relevant because our samples include several countries and thus translations into several different languages¹⁰. Previous research has shown that concepts differ in the degree to which they are robust to translation (Repke & Dorer, 2021), and emotions have been found to be interpreted somewhat differently in different cultures (Weidman et al., 2017).

The single question asking about people's climate change worry does not capture the psychological distance of climate change, the issue's importance, or even what specific aspects people worry about. All of these factors could influence (the strength of) the established relationships between climate change beliefs and worry, and between worry and behavior. Future research should aim to gain a better understanding of what people think about when they answer questions about climate change worry, for example by using open-ended questions. These open-ended questions could focus on what people think of as 'worrying' and what it is that makes them worry (or not). Such open-ended questions may be especially relevant in the context of climate change worry, where one can differentiate between worry *for* (e.g., loss of biodiversity) and *from* the environment (e.g., extreme weather harming humans). Research could further aim to investigate differences in responses between relevant demographic and ideological groups. For example, when right-leaning individuals worry about climate change, the content of their worries might be different from that of left-leaning individuals.

Research from the US indicates that surveys on climate change are relatively robust with regard to order and wording manipulations (Chen, MacInnis, Waltman, & Krosnick, 2021). However, Greenhill, Leviston, Leonard, and Walker (2013) found that the answer options used in different surveys can influence estimated levels of belief in anthropogenic climate change. Focusing specifically on the political polarization in climate change beliefs, Motta, Chapman, Stecula, and Haglin (2019) conclude that response options might especially - and strongly - influence the

¹⁰ Official translation guidelines for the ESS are available online (European Social Survey, 2016b).

estimated number of Republicans who report believing in human-caused climate change. Consequently, response options should be carefully considered in future research focusing on possible differences between political and ideological groups.

4.2.3 Linearity

In all three papers, linear regressions were used to investigate relationships between the variables. This means that the model assumes linear correlations between, for example, worry about climate change and energy-saving behaviors, meaning that the relationship is constant and follows a straight line. Consequently, it is assumed that an increase in worry will always lead to an equally large increase in curtailment- and efficiency behaviors. The true relationship might instead be curvilinear (Allen, 2017). For example, the relationship could follow an inverted u-curve: medium worry could be more effective in motivating energy-saving behaviors compared to both very low and very high worry.

The question on linearity is also highly relevant for interaction effects. In both Paper I and Paper II, we look at multiplicative interactions between an independent variable and a suggested moderator. We examine (i) whether the relationship between climate change beliefs and worry changes based on political orientation, and (ii) whether the relationship between worry about climate change and energy-saving behaviors changes based on efficacy beliefs. Multiplicative interaction effects assume that the interaction between the predictor (e.g., worry) and the moderator (e.g., efficacy belief) is linear. However, the true effects are just as often curvilinear, as highlighted by Hainmueller, Mummolo, and Xu (2019). Consequently, our findings should be understood as a linear approximation, not a true model. Future research could consider curvilinear effects both theoretically and methodologically.

4.2.4 Type I and Type II errors

One issue with quantitative data analysis is the risk of Type 1 error (false-positive findings) and Type 2 error (false-negative findings) (Akobeng, 2016). Type 1 error is especially problematic because it indicates that a relationship exists where it does not. Furthermore, false positives are especially hard to invalidate once they are published

(Simmons, Nelson, & Simonsohn, 2011). The large sample sizes in the datasets used in the current project reduce the likelihood of false-negative results (Type 2 error). However, Type 1 error remains a risk. This is especially relevant for the findings with a significance level close to .05, where one out of twenty findings might have occurred by chance and thus incorrectly identified an effect as significant where no such difference exists. This applies to, for example, the interaction between worry about climate change and personal outcome expectancy in the model predicting curtailment behavior, and the interaction between worry and collective outcome expectancy when predicting energy efficiency behaviors. The risk of false positives is even higher given the small effect sizes (Ioannidis, 2005). Consequently, the established effects should be replicated and investigated further in future research. For a discussion of issues related to false positives, see Simmons et al. (2011).

4.2.5 Representativeness

Although the project utilizes large random and representative samples, and additionally includes weighting variables to compensate for sampling bias, it is well-known that certain groups tend to be underrepresented (e.g., Jang & Vorderstrasse, 2019) and that country-level factors can influence response rates (Daikeler, Silber, & Bošnjak). Nonresponse bias (Lavrakas, 2008a) might influence both who is included in the final dataset as well as who chooses to not answer specific questions in the survey (e.g. the questions about income and political orientation typically have more non-responses). Nonresponse has been an increasing issue in survey research in the recent years, also in the ESS, although the trend is inconsistent across countries (Koen, Loosveldt, Vandenplas, & Stoop, 2018). Consequently, it is important to remember that a sample will never be fully representative of the population.

4.3 Practical implications

The studies' large sample sizes make it highly likely that statistically significant relationships will be detected, even when the effect sizes are very small (Sullivan & Feinn, 2012). Small effect sizes are quite usual in psychological research (Götz, Gosling, & Rentfrow, 2021) because of the complexity of human behavior, and they

can still be highly relevant; changing 6% of the variance in behavior could have a large practical impact in some cases. Small effect sizes also remind us that there are no simple solutions to increase worry or climate change mitigation behavior. This interpretation is in line with other scholars who call for caution in drawing hasty conclusions on how to use emotions in climate communication strategies, as emotions are not ‘simple levers’ to be pulled to elicit behavior change (Chapman et al., 2017).

Despite these limitations, the results do suggest some practical implications. The relatively modest level of worry about climate change across most European countries can indicate that many do not feel at risk and therefore lack the motivation to act. Even though information alone will not solve this issue, there is still a need to educate about the causes and consequences of climate change and about possible solutions. The first step in avoiding or debunking misinformation, including misinformation regarding the causes and consequences of climate change, is to continue repeating facts while referring to expert sources (Van der Linden, 2022). There is likely no message that is equally effective among all groups. However, communicating the scientific consensus might help correct false beliefs and reduce ideological polarization (Van der Linden, 2021).

The observed differences in climate change perception between countries and between demographic and ideological groups call for risk communication that accounts for these differences; the consequences and solutions must be relevant and seem important to the groups of people we want to reach. Communicated climate change consequences should be concrete rather than abstract (Van Lange & Huckelba, 2021) and tailored to local circumstances (Van Lange, Joireman, & Milinski, 2018). According to the risk-as-feelings hypothesis, information about risk is more emotionally involving and more effective if it is vividly connected to personal experiences, people, and anecdotes (Loewenstein et al., 2001). An additional strategy can be to emphasize global identity when communicating about climate change impacts that are likely perceived as socially or spatially distant (Loy & Spence, 2020).

The results of Paper II indicate that people are more likely to engage in climate change mitigation behavior if they experience a combination of worry about climate change and high outcome expectancies. Respondents reported higher mean levels of personal efficacy than collective efficacy and higher mean levels of collective outcome expectancy than personal outcome expectancy. This indicates a potential to increase people's sense of working together towards a shared goal, for example by highlighting current efforts in their communities. One barrier to initiating engagement is that people fail to see how their individual actions contribute to solving climate change when it is framed as a global issue. In line with this, Moussaoui and Desrichard (2016) argue that it is more effective to frame mitigation goals at a lower level, for example at one's university. Another line of research has found that perceptions of personal and collective efficacy and outcome expectancy can be influenced by descriptive social norms (Doherty & Webler, 2016; Thøgersen, 2014). Consequently, highlighting what people are already doing to mitigate climate change can be an important part of public communication.

4.4 Ethical considerations

4.4.1 Using secondary data

The results of the current project are based on secondary data, which comes with both advantages and disadvantages. On the one hand, secondary data means that the researcher has limited knowledge of and control over (the quality of) survey objectives, question development, formulation of questions and answer categories, and data collection and handling. However, both the ESS and EPCC projects offer substantial documentation of all steps taken, from the formulation of questions to translation, data collection, and response rates. Each of the three papers had at least one co-author who was involved in the original ESS or EPCC studies.

On the other hand, secondary data offers clear advantages in terms of cost and labor effectiveness, time constraints, and data volume. Using data for several different research purposes reduces the toll on research participants, which is especially important with regard to hard-to-reach populations. Since the overarching aim of the

project was to tap into public perceptions across European countries, the ESS and EPCC offer data quality and richness that would have been unrealistic to collect for this project specifically.

4.4.2 Objectivity

According to the value-free ideal¹¹, researchers should strive to minimize the influence of social, ethical, and political values in data gathering and theory development (Reiss & Sprenger, 2017). Survey results from Norway have shown that more people perceive climate and environmental research to be highly politicized (54%) compared to, for example, research in medicine (33%) or technology (27%) (Kantar TNS, 2017). Contemplating the social, ethical, and political aspects of research might be especially relevant when researching issues considered ‘political’, such as climate change, and in light of the lack of political diversity within the social sciences and psychology¹² (Enstad & Thorbjørnsrud, 2022; Gross & Simmons, 2007; Klein & Stern, 2009).

Values can affect research in several ways. First, they might guide *what* is researched. This can be problematic because research ties up resources, meaning that some research areas or research questions will be investigated at the expense of others. For example, an excessive focus on replicating findings from the US regarding ideology and ideological differences might limit opportunities to examine and understand other relevant variables and relationships. However, because replication is one of the pillars of science, looking at the effect of ideology with regard to different framings or within different contexts could also be seen as something positive. Ideology is often included as a control variable in research looking at climate change views, together with age and gender, precisely *because* prior research has found consistent associations.

¹¹ Striving for objectivity is usually not considered equivalent to denying commitment, engagement, or the influence of values in research; instead, the goal is to reduce negative biases (Reiss & Sprenger, 2017).

¹² For a larger discussion of the issues with, and reasons for, a lack of political diversity in research, see the following sources (Duarte et al., 2015; Gross, 2013; Pfister & Böhm, 2015; Tetlock & Mitchell, 2015).

Another potential issue is that identifying and focusing on differences between (e.g., political) groups might contribute to polarization. However, focusing on differences between groups is important because it can yield a better understanding of why certain processes or communication efforts fail and help us communicate more effectively with a larger part of the public. Rather than avoiding accounting for group differences, we should consider how people, groups, and concepts are represented. This entails being aware of the language used and being careful to avoid mischaracterizing groups or exaggerating differences.

4.5 Conclusion

Climate change is one of the biggest threats facing our world today, and its potential impacts become more severe the longer we postpone actions to drastically reduce greenhouse gas emissions (IPCC, 2018). Changes in behavior and lifestyle to mitigate climate change have the potential to significantly bring down emissions, while also improving human well-being (IPCC, 2022b). Given that beliefs and emotions play central roles in initiating climate change mitigation behaviors, psychological research is highly relevant. The current project aimed to investigate climate change perceptions across Europe by exploring factors that might influence the relationships between climate change beliefs and worry, between worry and climate change mitigation behavior, and finally, what people imagine will be important climate change impacts on their country.

The results of the current project show that most people associate climate change impacts with environmental changes and that such beliefs are related to worry about climate change. Believing that climate change is caused by humans and will have negative consequences is related to higher levels of climate change worry, which is in turn related to both curtailment and efficiency energy-saving behaviors. The project's largest contribution to the current state of knowledge stems from investigating factors that alter these relationships.

The project finds that political orientation alters the relationship between climate change beliefs and worry, and that worry has a stronger relationship with energy-saving behaviors when combined with the belief that individual and collective action can help reduce climate change. People's beliefs about important climate change impacts on their country, as well as their level of worry and reported energy-saving behaviors are affected by demographic factors and the country in which they live. Future research could aim to gain a better understanding of the causal relationships between climate change beliefs, emotions, and climate change mitigation behavior.

References

- Aitken, C., Chapman, R., & McClure, J. (2011). Climate change, powerlessness and the commons dilemma: Assessing New Zealanders' preparedness to act. *Global Environmental Change, 21*(2), 752-760.
<https://doi.org/10.1016/j.gloenvcha.2011.01.002>
- Akobeng, A. K. (2016). Understanding type I and type II errors, statistical power and sample size. *Acta Paediatr, 105*(6), 605-609. <https://doi.org/10.1111/apa.13384>
- Alcock, I., White, M. P., Taylor, T., Coldwell, D. F., Gribble, M. O., Evans, K. L., Corner, A., Vardoulakis, S., & Fleming, L. E. (2017). 'Green' on the ground but not in the air: Pro-environmental attitudes are related to household behaviours but not discretionary air travel. *Global Environmental Change, 42*, 136-147. <https://doi.org/10.1016/j.gloenvcha.2016.11.005>
- Allen, M. (2017). *The SAGE encyclopedia of communication research methods*.
<https://doi.org/10.4135/9781483381411>
- Angill-Williams, A., & Davis, C. J. (2021). Increasing climate efficacy is not a surefire means to promoting climate commitment. *Thinking & Reasoning, 1*-21.
<https://doi.org/10.1080/13546783.2021.1979651>
- American Psychological Association Task Force on Climate Change. (2022). *Addressing the Climate Crisis: An Action Plan for Psychologists, Report of the APA Task Force on Climate Change*.
<https://www.apa.org/news/press/releases/2022/02/climate-crisis-action-plan.pdf>
- Appelbaum, R. P. (1977). The future is made, not predicted: Technocratic planners vs. public interests. *Society, 14*(4), 49-53. <https://doi.org/10.1007/BF02694333>
- Attari, S. Z., DeKay, M. L., Davidson, C. I., & De Bruin, W. B. (2010). Public perceptions of energy consumption and savings. *Proceedings of the National Academy of sciences, 107*(37), 16054-16059.
<https://doi.org/10.1073/pnas.1001509107>
- Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review, 84*(2), 191. <https://doi.org/10.1037/0033-295X.84.2.191>

-
- Bandura, A. (1986). *Social foundations of thought and action: A Social cognitive theory*. Prentice-Hall, Inc.
- Bandura, A. (1994). Self-efficacy. In V. S. Ramachaudran (Ed.), *Encyclopedia of human behavior* (Vol. 4, pp. 71-81). Academic Press.
- Bandura, A. (2000). Exercise of human agency through collective efficacy. *Current directions in psychological science*, 9(3), 75-78. <https://doi.org/10.1111/1467-8721.00064>
- Bateman, T. S., & O'Connor, K. (2016). Felt responsibility and climate engagement: Distinguishing adaptation from mitigation. *Global Environmental Change*, 41, 206-215. <https://doi.org/10.1016/j.gloenvcha.2016.11.001>
- Bayes, R., & Druckman, J. N. (2021). Motivated reasoning and climate change. *Current Opinion in Behavioral Sciences*, 42, 27-35. <https://doi.org/10.1016/j.cobeha.2021.02.009>
- Berry, H. L., & Peel, D. (2015). Worrying about climate change: is it responsible to promote public debate? *BJPsych. International*, 12(2), 31-32. <https://doi.org/10.1192/S2056474000000234>
- Böhm, G. (2003). Emotional reactions to environmental risks: Consequentialist versus ethical evaluation. *Journal of Environmental Psychology*, 23(2), 199-212. [https://doi.org/10.1016/S0272-4944\(02\)00114-7](https://doi.org/10.1016/S0272-4944(02)00114-7)
- Böhm, G., & Pfister, H.-R. (2001). Mental representation of global environmental risks. *Environmental risks: Perception, evaluation and management*, 1-30. [https://doi.org/10.1016/S0196-1152\(01\)80022-3](https://doi.org/10.1016/S0196-1152(01)80022-3)
- Borkovec, T. D., Robinson, E., Pruzinsky, T., & DePree, J. A. (1983). Preliminary exploration of worry: Some characteristics and processes. *Behaviour Research and Therapy*, 21(1), 9-16. [https://doi.org/10.1016/0005-7967\(83\)90121-3](https://doi.org/10.1016/0005-7967(83)90121-3)
- Borozan, D. (2018). Regional-level household energy consumption determinants: The European perspective. *Renewable and Sustainable Energy Reviews*, 90, 347-355. <https://doi.org/10.1016/j.rser.2018.03.038>
- Bostrom, A. (2017). Mental models and risk perceptions related to climate change. *Oxford Research Encyclopedias*. <https://doi.org/10.1093/acrefore/9780190228620.013.303>

-
- Bostrom, A., Hayes, A. L., & Crosman, K. M. (2019). Efficacy, action, and support for reducing climate change risks. *Risk Analysis*, *39*(4), 805-828. <https://doi.org/10.1111/risa.13210>
- Bostrom, A., Morgan, M. G., Fischhoff, B., & Read, D. (1994). What do people know about global climate change? 1. Mental models. *Risk Analysis*, *14*(6), 959-970. <https://doi.org/10.1111/j.1539-6924.1994.tb00065.x>
- Boudet, H. S. (2019). Public perceptions of and responses to new energy technologies. *Nature Energy*, *4*(6), 446-455. <https://doi.org/10.1038/s41560-019-0399-x>
- Bouman, T., Verschoor, M., Albers, C. J., Böhm, G., Fisher, S. D., Poortinga, W., Whitmarsh, L., & Steg, L. (2020). When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions. *Global Environmental Change*, *62*, 102061. <https://doi.org/10.1016/j.gloenvcha.2020.102061>
- Brewer, P. R. (2012). Polarisation in the USA: Climate change, party politics, and public opinion in the Obama era. *European Political Science*, *11*(1), 7-17. <https://doi.org/10.1057/eps.2011.10>
- Brosch, T. (2021). Affect and emotions as drivers of climate change perception and action: a review. *Current Opinion in Behavioral Sciences*, *42*, 15-21. <https://doi.org/10.1016/j.cobeha.2021.02.001>
- Brosch, T., & Steg, L. (2021). Leveraging emotion for sustainable action. *One Earth*, *4*(12), 1693-1703. <https://doi.org/10.1016/j.oneear.2021.11.006>
- Brügger, A., Dessai, S., Devine-Wright, P., Morton, T. A., & Pidgeon, N. F. (2015). Psychological responses to the proximity of climate change. *Nature Climate Change*, *5*(12), 1031-1037. <https://doi.org/10.1038/nclimate2760>
- Brügger, A., Morton, T. A., & Dessai, S. (2016). "Proximising" climate change reconsidered: A construal level theory perspective. *Journal of Environmental Psychology*, *46*, 125-142. <https://doi.org/10.1016/j.jenvp.2016.04.004>
- Burgess, A. (2015). Social construction of risk. In H. Cho, T. Reimer & K. A. McComas (Eds.), *The SAGE handbook of risk communication* (pp. 56-68). SAGE Publications, Inc.

-
- Campbell, E., Kotcher, J., Maibach, E., Rosenthal, S. A., & Leiserowitz, A. (2021). Predicting the importance of global warming as a voting issue among registered voters in the United States. *Current Research in Ecological and Social Psychology*, 100008. <https://doi.org/10.1016/j.cresp.2021.100008>
- Campbell, T. H., & Kay, A. C. (2014). Solution aversion: On the relation between ideology and motivated disbelief. *Journal of personality and social psychology*, 107(5), 809. <https://doi.org/10.1037/a0037963>
- Capstick, S. B., & Pidgeon, N. F. (2014). What is climate change scepticism? Examination of the concept using a mixed methods study of the UK public. *Global Environmental Change*, 24, 389-401. <https://doi.org/10.1016/j.gloenvcha.2013.08.012>
- Chapman, D. A., Lickel, B., & Markowitz, E. M. (2017). Reassessing emotion in climate change communication. *Nature Climate Change*, 7(12), 850-852. <https://doi.org/10.1038/s41558-017-0021-9>
- Chen, C., MacInnis, B., Waltman, M., & Krosnick, J. A. (2021). Public opinion on climate change in the USA: to what extent can it be nudged by questionnaire design features? *Climatic Change*, 167(3), 35. <https://doi.org/10.1007/s10584-021-03194-x>
- Chen, M.-F. (2015). Self-efficacy or collective efficacy within the cognitive theory of stress model: Which more effectively explains people's self-reported proenvironmental behavior? *Journal of Environmental Psychology*, 42, 66-75. <https://doi.org/10.1016/j.jenvp.2015.02.002>
- Clayton, S., & Karazsia, B. T. (2020). Development and validation of a measure of climate change anxiety. *Journal of Environmental Psychology*, 69, 101434. <https://doi.org/10.1016/j.jenvp.2020.101434>
- Clayton, S., & Manning, C. (2018). *Psychology and climate change: human perceptions, impacts, and responses*. Academic Press.
- Clayton, S., Manning, C. M., Speiser, M., & Hill, A. N. (2021). *Mental health and our changing climate: Impacts, inequities, responses*. American Psychological Association, and ecoAmerica. <https://www.apa.org/news/press/releases/mental-health-climate-change.pdf>

-
- Clement, C. A., Henning, J. B., & Osbaldiston, R. (2014). Integrating factors that predict energy conservation: the theory of planned behavior and beliefs about climate change. *Journal of Sustainable Development*, 7(6).
<https://doi.org/10.5539/jsd.v7n6p46>
- Cologna, V., Bark, R. H., & Paavola, J. (2017). Flood risk perceptions and the UK media: Moving beyond “once in a lifetime” to “Be Prepared” reporting. *Climate Risk Management*, 17, 1-10. <https://doi.org/10.1016/j.crm.2017.04.005>
- Cologna, V., Berthold, A., & Siegrist, M. (2022). Knowledge, perceived potential and trust as determinants of low- and high-impact pro-environmental behaviours. *Journal of Environmental Psychology*, 79, 101741.
<https://doi.org/10.1016/j.jenvp.2021.101741>
- Corner, A., Whitmarsh, L., & Xenias, D. (2012). Uncertainty, scepticism and attitudes towards climate change: biased assimilation and attitude polarisation. *Climatic Change*, 114(3), 463-478. <https://doi.org/10.1007/s10584-012-0424-6>
- Craik, K. J. W. (1943). *The nature of explanation*: Cambridge University Press.
- Creutzig, F., Roy, J., Lamb, W. F., Azevedo, I. M. L., Bruine de Bruin, W., Dalkmann, H., Edelenbosch, O. Y., Geels, F. W., Grubler, A., Hepburn, C., Hertwich, E. G., Khosla, R., Mattauch, L., Minx, J. C., Ramakrishnan, A., Rao, N. D., Steinberger, J. K., Tavoni, M., Ürge-Vorsatz, D., & Weber, E. U. (2018). Towards demand-side solutions for mitigating climate change. *Nature Climate Change*, 8(4), 260-263. <https://doi.org/10.1038/s41558-018-0121-1>
- Cruz, S. M. (2017). The relationships of political ideology and party affiliation with environmental concern: A meta-analysis. *Journal of Environmental Psychology*, 53, 81-91. <https://doi.org/10.1016/j.jenvp.2017.06.010>
- Czarnek, G., Kossowska, M., & Szwed, P. (2021). Right-wing ideology reduces the effects of education on climate change beliefs in more developed countries. *Nature Climate Change*, 11(1), 9-13. <https://doi.org/10.1038/s41558-020-00930-6>
- Daikeler, J., Silber, H., & Bošnjak, M. (2021). A Meta-Analysis of How Country-Level Factors Affect Web Survey Response Rates. *International Journal of Market Research*, 64(3), <https://doi.org/10.1177/14707853211050916>

-
- Dake, K. (1991). Orienting dispositions in the perception of risk: An analysis of contemporary worldviews and cultural biases. *Journal of Cross-Cultural Psychology, 22*(1), 61-82. <https://doi.org/10.1177/0022022191221006>
- Dalton, R. J., Farrell, D. M., & McAllister, I. (2011). *Political parties and democratic linkage: How parties organize democracy*. Oxford University Press.
- Dietz, T., Gardner, G. T., Gilligan, J., Stern, P. C., & Vandenberg, M. P. (2009). Household actions can provide a behavioral wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences, 106*(44), 18452-18456. <https://doi.org/10.1073/pnas.0908738106>
- Dijkstra, A., & Brosschot, J. (2003). Worry about health in smoking behaviour change. *Behaviour Research and Therapy, 41*(9), 1081-1092. [https://doi.org/10.1016/S0005-7967\(02\)00244-9](https://doi.org/10.1016/S0005-7967(02)00244-9)
- Doherty, K. L., & Webler, T. N. (2016). Social norms and efficacy beliefs drive the Alarmed segment's public-sphere climate actions. *Nature Climate Change, 6*(9), 879-884. <https://doi.org/10.1038/nclimate3025>
- Doherty, T. J., & Clayton, S. (2011). The psychological impacts of global climate change. *American Psychologist, 66*(4), 265-276. <https://doi.org/10.1037/a0023141>
- Douglas, M., & Wildavsky, A. (1982). *Risk and culture: An essay on the selection of technological and environmental dangers*: Univ of California Press.
- Driscoll, D. (2019). Assessing sociodemographic predictors of climate change concern, 1994–2016. *Social Science Quarterly, 100*(5), 1699-1708. <https://doi.org/10.1111/ssqu.12683>
- Druckman, J. N., & McGrath, M. C. (2019). The evidence for motivated reasoning in climate change preference formation. *Nature Climate Change, 9*(2), 111-119. <https://doi.org/10.1038/s41558-018-0360-1>
- Drummond, C., & Fischhoff, B. (2017). Individuals with greater science literacy and education have more polarized beliefs on controversial science topics. *Proceedings of the National Academy of Sciences, 114*(36), 9587-9592. <https://doi.org/10.1073/pnas.1704882114>

-
- Duarte, J. L., Crawford, J. T., Stern, C., Haidt, J., Jussim, L., & Tetlock, P. E. (2015). Political diversity will improve social psychological science. *Behavioral and Brain Sciences*, 38, e130. <https://doi.org/10.1017/S0140525X14000430>
- Edwards, A. L. (1957). *The social desirability variable in personality assessment and research*. Dryden.
- Enstad, J. D., & Thorbjørnsrud, K. (2022). Politisk meningsmangfold og ytringsfrihet i akademia. In M. Mangset, A. H. Midtbøen & K. Thorbjørnsrud (Eds.), *Ytringsfrihet i en ny offentlighet* (pp. 155 - 179). Universitetsforlaget.
- European Commission. (2019). *The European Green Deal*. COM(2019) 640 Final. https://eur-lex.europa.eu/resource.html?uri=cellar:b828d165-1c22-11ea-8c1f-01aa75ed71a1.0002.02/DOC_1&format=PDF
- European Social Survey. (2016a). Data file edition 2.0. NSD - Norwegian Centre for Research Data, Norway - Data archive and distributor of ESS data for ESS ERIC <https://doi.org/10.21338/NSD-ESS8-2016>.
- European Social Survey. (2016b). ESS Round 8 translation guidelines. ESS ERIC. https://www.europeansocialsurvey.org/docs/round8/methods/ESS8_translation_guidelines.pdf
- European Social Survey. (2017). ESS Round 8 (2016/2017) Technical Report. ESS ERIC. https://www.europeansocialsurvey.org/docs/round8/survey/ESS8_data_documentation_report_e02_1.pdf
- Farjam, M., Nikolaychuk, O., & Bravo, G. (2019). Experimental evidence of an environmental attitude-behavior gap in high-cost situations. *Ecological Economics*, 166, 106434. <https://doi.org/10.1016/j.ecolecon.2019.106434>
- Feinberg, M., & Willer, R. (2011). Apocalypse Soon?: Dire Messages Reduce Belief in Global Warming by Contradicting Just-World Beliefs. *Psychological Science*, 22(1), 34-38. <https://doi.org/10.1177/0956797610391911>
- Feldman, L., & Hart, P. S. (2018). Is there any hope? How climate change news imagery and text Influence audience emotions and support for climate mitigation policies. *Risk Analysis*, 38(3), 585-602. <https://doi.org/10.1111/risa.12868>

-
- Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford University Press.
- Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy Sciences*, 9(2), 127-152. <https://doi.org/10.1007/BF00143739>
- Flynn, C., Yamasumi, E., Fisher, S., Snow, D., Grant, Z., Kirby, M., Browning, P., Rommerskirchen, M., & Russell, I. (2021). *Peoples' Climate Vote: United Nations Development Programme and University of Oxford*. <https://www.undp.org/content/undp/en/home/librarypage/climate-and-disaster-resilience-/The-Peoples-Climate-Vote-Results.html>
- Fointiat, V. (2011). Saying, but not doing: Induced hypocrisy, trivialization, and misattribution. *Social behavior and personality: An international journal*, 39(4), 465-475. <https://doi.org/10.2224/sbp.2011.39.4.465>
- Forchtner, B., Kroneder, A., & Wetzel, D. (2018). Being skeptical? Exploring far-right climate-change communication in Germany. *Environmental Communication*, 12(5), 589-604. <https://doi.org/10.1080/17524032.2018.1470546>
- Fransson, N., & Gärling, T. (1999). Environmental concern: Conceptual definitions, measurement methods, and research findings. *Journal of Environmental Psychology*, 19(4), 369-382. <https://doi.org/10.1006/jevp.1999.0141>
- Frantz, C. M., & Mayer, F. S. (2009). The emergency of climate change: Why are we failing to take action? *Analyses of Social Issues and Public Policy*, 9(1), 205-222. <https://doi.org/10.1111/j.1530-2415.2009.01180.x>
- Frijda, N. H. (1987). Emotion, cognitive structure, and action tendency. *Cognition and Emotion*, 1(2), 115-143. <https://doi.org/10.1080/02699938708408043>
- Frijda, N. H. (2004). Emotions and Action. In A. Fischer, A. S. R. Manstead & N. Frijda (Eds.), *Feelings and Emotions: The Amsterdam Symposium* (pp. 158-173). Cambridge University Press.
- Frijda, N. H. (2010). Impulsive action and motivation. *Biological Psychology*, 84(3), 570-579. <https://doi.org/10.1016/j.biopsycho.2010.01.005>
- Frijda, N. H., Manstead, A. S. R., & Bem, S. (2000). *Emotions and beliefs: How feelings influence thoughts*. Cambridge University Press.

-
- Fritsche, I., Moya, M., Bukowski, M., Jugert, P., de Lemus, S., Decker, O., Valor-Segura, I., & Navarro-Carrillo, G. (2017). The great recession and group-based control: Converting personal helplessness into social class in-group trust and collective action. *Journal of Social Issues, 73*(1), 117-137.
<https://doi.org/10.1111/josi.12207>
- Fuchs, C., & Diamantopoulos, A. (2009). Using single-item measures for construct measurement in management research: Conceptual issues and application guidelines. *Die Betriebswirtschaft, 69*(2), 195. https://temme.wiwi.uni-wuppertal.de/fileadmin/_migrated/content_uploads/fuchs_diamantopoulos_2009.pdf
- Gardner, G. T., & Stern, P. C. (2008). The short list: The most effective actions US households can take to curb climate change. *Environment: science and policy for sustainable development, 50*(5), 12-25.
<https://doi.org/10.3200/ENVT.50.5.12-25>
- Gaspar, R., & Antunes, D. (2011). Energy efficiency and appliance purchases in Europe: Consumer profiles and choice determinants. *Energy Policy, 39*(11), 7335-7346. <https://doi.org/10.1016/j.enpol.2011.08.057>
- Gifford, R. (2011). The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist, 66*(4), 290-302.
<https://doi.org/10.1037/a0023566>
- Goldberg, M. H., Gustafson, A., Ballew, M. T., Rosenthal, S. A., & Leiserowitz, A. (2020). Identifying the most important predictors of support for climate policy in the United States. *Behavioural Public Policy, 1*-23.
<https://doi.org/10.1017/bpp.2020.39>
- Gosling, P., Denizeau, M., & Oberlé, D. (2006). Denial of responsibility: A new mode of dissonance reduction. *Journal of Personality and Social Psychology, 90*(5), 722-733. <https://doi.org/10.1037/0022-3514.90.5.722>
- Götz, F. M., Gosling, S. D., & Rentfrow, P. J. (2022). Small effects: The indispensable foundation for a cumulative psychological science. *Perspectives on Psychological Science, 17*(1) <https://doi.org/10.1177/1745691620984483>

-
- Greenhill, M., Leviston, Z., Leonard, R., & Walker, I. (2013). Assessing climate change beliefs: Response effects of question wording and response alternatives. *Public Understanding of Science, 23*(8), 947-965.
<https://doi.org/10.1177/0963662513480117>
- Griskevicius, V., Tybur, J. M., & Van den Bergh, B. (2010). Going green to be seen: Status, reputation, and conspicuous conservation. *Journal of Personality and Social Psychology, 98*(3), 392-404. <https://doi.org/10.1037/a0017346>
- Gross, N. (2013). *Why are professors liberal and why do conservatives care?* Harvard University Press.
- Gross, N., & Simmons, S. (2007). *The social and political views of American professors*. Working Paper presented at a Harvard University Symposium on Professors and Their Politics, October 6, 2007.
<http://www.housesim.com/media/img/10.1.1.147.6141.pdf>
- Hainmueller, J., Mummolo, J., & Xu, Y. (2019). How much should we trust estimates from multiplicative interaction models? Simple tools to improve empirical practice. *Political Analysis, 27*(2), 163-192.
<https://doi.org/10.1017/pan.2018.46>
- Hamann, K. R. S., & Reese, G. (2020). My influence on the world (of others): Goal efficacy beliefs and efficacy affect predict private, public, and activist pro-environmental behavior. *Journal of Social Issues, 76*(1), 35-53.
<https://doi.org/10.1111/josi.12369>
- Hamilton, L. C. (2011). Education, politics and opinions about climate change evidence for interaction effects. *Climatic Change, 104*(2), 231-242.
<http://dx.doi.org/10.1007/s10584-010-9957-8>
- Hamilton, L. C., Hartter, J., & Grimm, C. (2020). Sociopolitical silos: Environmental views and the multiplicative effect of same-party friends. *Faculty Publications, 923*. https://scholars.unh.edu/faculty_pubs/923
- Heath, Y., & Gifford, R. (2002). Extending the theory of planned behavior: Predicting the use of public transportation *Journal of Applied Social Psychology, 32*(10), 2154-2189. <https://doi.org/10.1111/j.1559-1816.2002.tb02068.x>

-
- Hohenemser, C., Kaspersen, R. E., & Kates, R. W. (1985). Causal Structure. In R. W. Kates, C. Hohenemser & R. E. Kaspersen (Eds.), *Perilous Progress: Managing the Hazards of Technology* (pp. 25-42): Westview Press.
- Homburg, A., & Stolberg, A. (2006). Explaining pro-environmental behavior with a cognitive theory of stress. *Journal of Environmental Psychology, 26*(1), 1-14. <https://doi.org/10.1016/j.jenvp.2006.03.003>
- Hornsey, M. J., & Fielding, K. S. (2016). A cautionary note about messages of hope: Focusing on progress in reducing carbon emissions weakens mitigation motivation. *Global Environmental Change, 39*, 26-34. <https://doi.org/10.1016/j.gloenvcha.2016.04.003>
- Hornsey, M. J., & Fielding, K. S. (2020). Understanding (and reducing) inaction on climate change. *Social Issues and Policy Review, 14*(1), 3-35. <https://doi.org/10.1111/sipr.12058>
- Hornsey, M. J., Fielding, K. S., McStay, R., Reser, J. P., Bradley, G. L., & Greenaway, K. H. (2015). Evidence for motivated control: Understanding the paradoxical link between threat and efficacy beliefs about climate change. *Journal of Environmental Psychology, 42*, 57-65. <https://doi.org/10.1016/j.jenvp.2015.02.003>
- Hornsey, M. J., Harris, E. A., Bain, P. G., & Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nature Climate Change, 6*(6), 622. <https://doi.org/10.1038/nclimate2943>
- Hornsey, M. J., Harris, E. A., & Fielding, K. S. (2018). Relationships among conspiratorial beliefs, conservatism and climate scepticism across nations. *Nature Climate Change, 8*(7), 614-620. <https://doi.org/10.1038/s41558-018-0157-2>
- Hox, J. J., Moerbeek, M., & Van de Schoot, R. (2017). *Multilevel analysis: Techniques and applications* (Third ed.). Routledge.
- International Energy Agency. (2021). «Total final consumption (TFC) by sector, Europe 1990-2019». <https://www.iea.org/data-and-statistics/data-browser/?country=WEOEUR&fuel=Energy%20consumption&indicator=TFCS> hareBySector

-
- Ioannidis, J. P. A. (2005). Why most published research findings are false. *PLOS Medicine*, 2(8). <https://doi.org/10.1371/journal.pmed.0020124>
- Intergovernmental Panel on Climate Change. (2014). *Climate change 2014: synthesis report. Contribution of Working Groups I, II and III to the fifth assessment report of the Intergovernmental Panel on Climate Change*. [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.
- Intergovernmental Panel on Climate Change. (2018). *Global warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [P. Z. V. Masson-Delmotte, H. O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J. B. R. Matthews, Y. Chen, X. Zhou, M. I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, T. Waterfield (eds)]. In press.
- Intergovernmental Panel on Climate Change. (2021). *Climate Change 2021: The physical science basis. Contribution of Working group I to the Sixth assessment report of the Intergovernmental Panel on Climate Change* [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press.
- Intergovernmental Panel on Climate Change. (2022a). *Climate Change 2022: Impacts, adaptation, and vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Lösschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. In Press.
- Intergovernmental Panel on Climate Change. (2022b). Summary for Policymakers. In: *Climate Change 2022: Mitigation of Climate Change. Contribution of Working*

-
- Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* [P.R. Shukla, J. Skea, R. Slade, A. Al Khourdajie, R. van Diemen, D. McCollum, M. Pathak, S. Some, P. Vyas, R. Fradera, M. Belkacemi, A. Hasija, G. Lisboa, S. Luz, J. Malley, (eds.)]. Cambridge, UK and New York, NY, USA. <https://doi.org/10.1017/9781009157926.001>
- Jang, M., & Vorderstrasse, A. (2019). Socioeconomic status and racial or ethnic differences in participation: Web-based survey. *JMIR research protocols*, 8(4), e11865-e11865. <https://doi.org/10.2196/11865>
- Jost, J. T., Federico, C. M., & Napier, J. L. (2009). Political ideology: its structure, functions, and elective affinities. *Annu Rev Psychol*, 60, 307-337. <https://doi.org/10.1146/annurev.psych.60.110707.163600>
- Kahan, D. M. (2010). Fixing the communications failure. *Nature*, 463, 296. <https://doi.org/10.1038/463296a>
- Kahan, D. M. (2012). Cultural cognition as a conception of the cultural theory of risk. In S. Roeser, R. Hillerbrand, P. Sandin & M. Peterson (Eds.), *Handbook of risk theory* (pp. 725-759): Springer, Dordrecht.
- Kahan, D. M., Peters, E., Wittlin, M., Slovic, P., Ouellette, L. L., Braman, D., & Mandel, G. (2012). The polarizing impact of science literacy and numeracy on perceived climate change risks. *Nature Climate Change*, 2, 732. <https://dx.doi.org/10.1038/nclimate1547>
- Kaiser, F. G., & Gutscher, H. (2003). The proposition of a general version of the theory of planned behavior: predicting ecological behavior. *Journal of applied social psychology*, 33(3), 586-603. <https://doi.org/10.1111/j.1559-1816.2003.tb01914.x>
- Kantar TNS. (2017). *Holdninger til forskning [Attitudes to research]*.
- Karlin, B., Davis, N., Sanguinetti, A., Gamble, K., Kirkby, D., & Stokols, D. (2014). Dimensions of conservation: Exploring differences among energy behaviors. *Environment and Behavior*, 46(4), 423-452. <https://doi.org/10.1177/0013916512467532>
- Kasperson, R. E., Renn, O., Slovic, P., Brown, H. S., Emel, J., Goble, R., Kasperson, J. X., & Ratick, S. (1988). The social amplification of risk: A conceptual

-
- framework. *Risk analysis*, 8(2), 177-187. <https://doi.org/10.1111/j.1539-6924.1988.tb01168.x>
- Kempton, W. (1997). How the public views climate change. *Environment: Science and Policy for Sustainable Development*, 39(9), 12-21. <https://doi.org/10.1080/00139159709604765>
- Kempton, W., Harris, C. K., Keith, J. G., & Weihl, J. S. (1985). Chapter 6: Do consumers know «what works» in energy conservation? *Marriage & Family Review*, 9(1-2), 115-133. https://doi.org/10.1300/J002v09n01_07
- Kim, L., Ballew, M., Lacroix, K., Leiserowitz, A., & Marlon, J. (2020). *How does the American public perceive climate disasters?* Yale Program on Climate Change Communication. <https://climatecommunication.yale.edu/publications/how-does-the-american-public-perceive-climate-disasters/>
- Klassen, R. M. (2004). Optimism and realism: A review of self-efficacy from a cross-cultural perspective. *International Journal of Psychology*, 39(3), 205-230. <https://doi.org/10.1080/00207590344000330>
- Klein, D. B., & Stern, C. (2009). By the numbers: The ideological profile of professors. In R. Maranto, R. E. Redding & F. M. Hess (Eds.), *The politically correct university: Problems, scope, and reforms* (pp. 15-33): AEI Press.
- Koen, B., Loosveldt, G., Vandenplas, C., & Stoop, I. (2018). Response rates in the European Social Survey: Increasing, decreasing, or a matter of fieldwork efforts? *Survey Methods: Insights from the Field*. <https://surveyinsights.org/?p=9673>
- Koletsou, A., & Mancy, R. (2011). Which efficacy constructs for large-scale social dilemma problems? Individual and collective forms of efficacy and outcome expectancies in the context of climate change mitigation. *Risk Management*, 13(4), 184-208. <https://doi.org/10.1057/rm.2011.12>
- Kollmuss, A., & Agyeman, J. (2002). Mind the Gap: Why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, 8(3), 239-260. <https://doi.org/10.1080/13504620220145401>

-
- Kunda, Z. (1990). The case for motivated reasoning. *Psychological Bulletin*, 108(3), 480-498. <https://doi.org/10.1037/0033-2909.108.3.480>
- Lange, F., & Dewitte, S. (2019). Measuring pro-environmental behavior: Review and recommendations. *Journal of Environmental Psychology*, 63, 92-100. <https://doi.org/10.1016/j.jenvp.2019.04.009>
- Lavrakas, P. J. (2008a). Nonresponse Bias. *Encyclopedia of Survey Research Methods*. Sage Publications.
- Lavrakas, P. J. (2008b). Respondent Fatigue. *Encyclopedia of Survey Research Methods*. Sage Publications.
- Lazarus, R. S., & Folkman, S. (1984). *Stress, appraisal, and coping*. Springer publishing company.
- Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C.-Y., & Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nature climate change*, 5(11), 1014. <https://doi.org/10.1038/nclimate2728>
- Leiserowitz, A. (2006). Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change*, 77(1), 45-72. <https://doi.org/10.1007/s10584-006-9059-9>
- Leiserowitz, A., Carman, J., Buttermore, N., Wang, X., Rosenthal, S., Marlon, J., & Mulcahy, K. (2021). *International public opinion on climate change*. Yale Program on Climate Change Communication and Facebook Data for Good. <https://climatecommunication.yale.edu/publications/international-public-opinion-on-climate-change/>
- Leiserowitz, A., Maibach, E., Rosenthal, S., Kotcher, J., Bergquist, P., Ballew, M., Goldberg, M., Gustafson, A., & Wang, X. (2020). *Climate change in the American mind: April 2020*. Yale Program on Climate Change Communication. <https://climatecommunication.yale.edu/publications/climate-change-in-the-american-mind-april-2020/>
- Leiserowitz, A., Maibach, E., Rosenthal, S., Kotcher, J., Carman, J., Neyens, L., Marlon, J., Lacroix, K., & Goldberg, M. (2021). *Climate change in the American mind: September 2021*. Yale Program on Climate Change

-
- Communication. <https://climatecommunication.yale.edu/publications/climate-change-in-the-american-mind-september-2021/>
- Lewis, G. B., Palm, R., & Feng, B. (2019). Cross-national variation in determinants of climate change concern. *Environmental Politics*, 28(5), 793-821.
<https://doi.org/10.1080/09644016.2018.1512261>
- Linde, S. (2020). The politicization of risk: Party cues, polarization, and public perceptions of climate change risk. *Risk Analysis*, 40(10), 2002-2018.
<https://doi.org/10.1111/risa.13530>
- Loewenstein, G. F., Weber, E. U., Hsee, C. K., & Welch, N. (2001). Risk as feelings. *Psychological bulletin*, 127(2), 267. <https://doi.org/10.1037/0033-2909.127.2.267>
- Lord, C. G., Ross, L., & Lepper, M. R. (1979). Biased assimilation and attitude polarization: The effects of prior theories on subsequently considered evidence. *Journal of Personality and Social Psychology*, 37(11), 2098-2109.
<https://doi.org/10.1037/0022-3514.37.11.2098>
- Loy, L. S., & Spence, A. (2020). Reducing, and bridging, the psychological distance of climate change. *Journal of Environmental Psychology*, 67.
<https://doi.org/10.1016/j.jenvp.2020.101388>
- Lubell, M. (2002). Environmental activism as collective action. *Environment and Behavior*, 34(4), 431-454. <https://doi.org/10.1177/00116502034004002>
- Lubell, M., Zahran, S., & Vedlitz, A. (2007). Collective action and citizen responses to global warming. *Political Behavior*, 29(3), 391-413.
<https://doi.org/10.1007/s11109-006-9025-2>
- Lundberg, D. C., Tang, J. A., & Attari, S. Z. (2019). Easy but not effective: Why “turning off the lights” remains a salient energy conserving behaviour in the United States. *Energy Research & Social Science*, 58.
<https://doi.org/10.1016/j.erss.2019.101257>
- Luo, Y., & Zhao, J. (2021). Attentional and perceptual biases of climate change. *Current Opinion in Behavioral Sciences*, 42, 22-26.
<https://doi.org/10.1016/j.cobeha.2021.02.010>

-
- Mackay, C. M. L., Schmitt, M. T., Lutz, A. E., & Mendel, J. (2021). Recent developments in the social identity approach to the psychology of climate change. *Current Opinion in Psychology, 42*, 95-101. <https://doi.org/10.1016/j.copsyc.2021.04.009>
- Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology, 19*(5), 469-479. [https://doi.org/10.1016/0022-1031\(83\)90023-9](https://doi.org/10.1016/0022-1031(83)90023-9)
- Magnason, A. S. (2020). *Om tiden og vannet [On time and water]* (T. Myklebost, Trans.). Aschehoug.
- Mahl, D., Guenther, L., Schäfer, M. S., Meyer, C., & Siegen, D. (2020). “We are a bit blind about it”: A qualitative analysis of climate change-related perceptions and communication across south african communities. *Environmental Communication, 14*(6), 802-815. <https://doi.org/10.1080/17524032.2020.1736116>
- Maloney, E. K., Lapinski, M. K., & Witte, K. (2011). Fear appeals and persuasion: A review and update of the extended parallel process model. *Social and Personality Psychology Compass, 5*(4), 206-219. <https://doi.org/10.1111/j.1751-9004.2011.00341.x>
- Markle, G. L. (2013). Pro-environmental behavior: Does it matter how it’s measured? Development and validation of the pro-environmental behavior scale (PEBS). *Human Ecology, 41*(6), 905-914. <https://doi.org/10.1007/s10745-013-9614-8>
- Masson, T., & Fritsche, I. (2021). We need climate change mitigation and climate change mitigation needs the ‘We’: a state-of-the-art review of social identity effects motivating climate change action. *Current Opinion in Behavioral Sciences, 42*, 89-96. <https://doi.org/10.1016/j.cobeha.2021.04.006>
- McCaul, K. D., & Mullens, A. B. (2003). Affect, thought and self-protective health behavior: The case of worry and cancer screening. In J. Suls & K. A. Wallston (Eds.), *Social Psychological Foundations of Health and Illness* (pp. 137-168): Blackwell Publishing.

-
- McCright, A. M., Dunlap, R., & Marquart-Pyatt, S. T. (2015). Political ideology and views about climate change in the European Union. *25*, 1-21.
<http://dx.doi.org/10.1080/09644016.2015.1090371>
- McCright, A. M., & Dunlap, R. E. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *The Sociological Quarterly*, *52*(2), 155-194. <https://doi.org/10.1111/j.1533-8525.2011.01198.x>
- McCright, A. M., Marquart-Pyatt, S. T., Shwom, R., Brechin, S., & Allen, S. (2016). Ideology, capitalism, and climate: Explaining public views about climate change in the United States. *21*, 180-189.
<https://doi.org/10.1016/j.erss.2016.08.003>
- Merkley, E., & Stecula, D. A. (2018). Party elites or manufactured doubt? The informational context of climate change polarization. *Science Communication*, *40*(2), 258-274. <https://doi.org/10.1177/1075547018760334>
- Meyer, T. J., Miller, M. L., Metzger, R. L., & Borkovec, T. D. (1990). Development and validation of the penn state worry questionnaire. *Behaviour Research and Therapy*, *28*(6), 487-495. [https://doi.org/10.1016/0005-7967\(90\)90135-6](https://doi.org/10.1016/0005-7967(90)90135-6)
- Milfont, T. L. (2009). The effects of social desirability on self-reported environmental attitudes and ecological behaviour. *The Environmentalist*, *29*(3), 263-269.
<https://doi.org/10.1007/s10669-008-9192-2>
- Milfont, T. L. (2012). The interplay between knowledge, perceived efficacy, and concern about global warming and climate change: A one-year longitudinal study. *Risk Analysis*, *32*(6), 1003-1020. <https://doi.org/10.1111/j.1539-6924.2012.01800.x>
- Misslin, R. (2003). The defense system of fear: behavior and neurocircuitry. *Neurophysiol Clin*, *33*(2), 55-66. [https://doi.org/10.1016/s0987-7053\(03\)00009-1](https://doi.org/10.1016/s0987-7053(03)00009-1)
- Moore, J. (2015). Ecological footprints and lifestyle archetypes: Exploring dimensions of consumption and the transformation needed to achieve urban sustainability. *Sustainability*, *7*(4), 4747-4763. <https://doi.org/10.3390/su7044747>

-
- Morgan, M. G., Fischhoff, B., Bostrom, A., & Atman, C. J. (2002). *Risk communication: A mental models approach*: Cambridge University Press.
- Morin-Chassé, A., & Lachapelle, E. (2020). Partisan strength and the politicization of global climate change: a re-examination of Schuldt, Roh, and Schwarz 2015. *Journal of Environmental Studies and Sciences*, *10*(1), 31-40.
<https://doi.org/10.1007/s13412-019-00576-7>
- Motta, M., Chapman, D., Stecula, D., & Haglin, K. (2019). An experimental examination of measurement disparities in public climate change beliefs. *Climatic Change*, *154*(1), 37-47. <https://doi.org/10.1007/s10584-019-02406-9>
- Moussaoui, L. S., & Desrichard, O. (2016). Act local but don't think too global: The impact of ecological goal level on behavior. *The Journal of Social Psychology*, *156*(5), 536-552. <https://doi.org/10.1080/00224545.2015.1135780>
- Moxnes, E., & Saysel, A. K. (2009). Misperceptions of global climate change: information policies. *Climatic Change*, *93*(1-2), 15.
<https://doi.org/10.1007/s10584-008-9465-2>
- Nauges, C., & Wheeler, S. A. (2017). The complex relationship between households' climate change concerns and their water and energy mitigation behaviour. *Ecological Economics*, *141*, 87-94.
<https://doi.org/10.1016/j.ecolecon.2017.05.026>
- Nicholson-Cole, S. A. (2005). Representing climate change futures: a critique on the use of images for visual communication. *Computers, Environment and Urban Systems*, *29*(3), 255-273. <https://doi.org/10.1016/j.compenvurbsys.2004.05.002>
- Nickerson, R. S. (1998). Confirmation bias: A ubiquitous phenomenon in many guises. *Review of General Psychology*, *2*(2), 175-220.
<https://doi.org/10.1037/1089-2680.2.2.175>
- Nielsen, K. S., Clayton, S., Stern, P. C., Dietz, T., Capstick, S., & Whitmarsh, L. (2021). How psychology can help limit climate change. *American Psychologist*, *76*(1), 130-144. <https://doi.org/10.1037/amp0000624>
- Nielsen, K. S., Cologna, V., Lange, F., Brick, C., & Stern, P. C. (2021). The case for impact-focused environmental psychology. *Journal of Environmental Psychology*, *74*, 101559. <https://doi.org/10.1016/j.jenvp.2021.101559>

-
- Nielsen, K. S., Nicholas, K. A., Creutzig, F., Dietz, T., & Stern, P. C. (2021). The role of high-socioeconomic-status people in locking in or rapidly reducing energy-driven greenhouse gas emissions. *Nature Energy*.
<https://doi.org/10.1038/s41560-021-00900-y>
- Noll, B., Filatova, T., Need, A., & Taberna, A. (2022). Contextualizing cross-national patterns in household climate change adaptation. *Nature Climate Change*, *12*(1), 30-35. <https://doi.org/10.1038/s41558-021-01222-3>
- Ogunbode, C. A., Demski, C., Capstick, S. B., & Sposato, R. G. (2019). Attribution matters: Revisiting the link between extreme weather experience and climate change mitigation responses. *Global Environmental Change*, *54*, 31-39.
<https://doi.org/10.1016/j.gloenvcha.2018.11.005>
- Ojala, M., Cunsolo, A., Ogunbode, C. A., & Middleton, J. (2021). Anxiety, worry, and grief in a time of environmental and climate crisis: A narrative review. *Annual Review of Environment and Resources*, *46*(1), 35-58.
<https://doi.org/10.1146/annurev-environ-012220-022716>
- Olson, D. R. (1965). Note on Haslerud and Meyers' transfer-of-principles experiment. *Journal of educational psychology*, *56*, 107. <https://doi.org/10.1037/h0021760>
- Pew Research Center. (2019). *Climate change still seen as the top global threat, but cyberattacks a rising concern*
<https://www.pewresearch.org/global/2019/02/10/climate-change-still-seen-as-the-top-global-threat-but-cyberattacks-a-rising-concern/>
- Pew Research Center. (2020). *Despite pandemic, many Europeans still see climate change as greatest threat to their countries*
<https://www.pewresearch.org/global/2020/09/09/despite-pandemic-many-europeans-still-see-climate-change-as-greatest-threat-to-their-countries/>
- Pfister, H.-R., & Böhm, G. (2015). Political orientations do not cancel out, and politics is not about truth. *Behavioral and Brain Sciences*, *38*, 58.
<https://dx.doi.org/10.1017/S0140525X14001289>
- Pihkala, P. (2022). Toward a taxonomy of climate emotions. *Frontiers in Climate*, *3*.
<https://doi.org/10.3389/fclim.2021.738154>

-
- Pohjolainen, P., Kukkonen, I., Jokinen, P., Poortinga, W., Adedayo Ogunbode, C., Böhm, G., Fisher, S., & Umit, R. (2021). The role of national affluence, carbon emissions, and democracy in Europeans' climate perceptions. *Innovation: The European Journal of Social Science Research*, 1-19.
<https://doi.org/10.1080/13511610.2021.1909465>
- Poortinga, W., Fisher, S., Bohm, G., Steg, L., Whitmarsh, L., & Ogunbode, C. (2018). *European attitudes to climate change and energy. Topline results from Round 8 of the European Social Survey*.
https://www.europeansocialsurvey.org/docs/findings/ESS8_toplines_issue_9_c_limatechange.pdf
- Poortinga, W., Spence, A., Whitmarsh, L., Capstick, S., & Pidgeon, N. F. (2011). Uncertain climate: An investigation into public scepticism about anthropogenic climate change. *Global environmental change*, 21(3), 1015-1024.
<https://doi.org/10.1016/j.gloenvcha.2011.03.001>
- Poortinga, W., Steg, L., Vlek, C., & Wiersma, G. (2003). Household preferences for energy-saving measures: A conjoint analysis. *Journal of Economic Psychology*, 24(1), 49-64. [https://doi.org/10.1016/S0167-4870\(02\)00154-X](https://doi.org/10.1016/S0167-4870(02)00154-X)
- Poortinga, W., Whitmarsh, L., Steg, L., Böhm, G., & Fisher, S. (2019). Climate change perceptions and their individual-level determinants: A cross-European analysis. *Global Environmental Change*, 55, 25-35.
<https://doi.org/10.1016/j.gloenvcha.2019.01.007>
- Punter, P., Ochando-Pardo, M., & Garcia, J. (2011). Spanish secondary school students' notions on the causes and consequences of climate change. *International Journal of Science Education*, 33(3), 447-464.
<https://doi.org/10.1080/09500693.2010.492253>
- Rabe-Hesketh, S., & Skrondal, A. (2012). *Multilevel and longitudinal modeling using Stata* (Third Edition ed. Volume I: Continuous responses): Stata Press.
- Rahmstorf, S. (2004). The climate sceptics. Potsdam: Potsdam Institute for Climate Impact Research. Accessed March, 15, 2022 https://www.pik-potsdam.de/~stefan/Publications/Other/rahmstorf_climate_sceptics_2004.pdf

-
- Reiss, J., & Sprenger, J. (2017). Scientific objectivity. In E. N. Zalta (Ed.), *The Stanford Encyclopedia of Philosophy*
<https://plato.stanford.edu/entries/scientific-objectivity/#Bib>
- Renn, O., & Rohrman, B. (2000). Cross-cultural risk perception: State and challenges. In O. Renn & B. Rohrman (Eds.), *Cross-Cultural Risk Perception: A Survey of Empirical Studies* (pp. 211-233). Springer US.
- Repke, L., & Dorer, B. (2021). Translate wisely! An evaluation of close and adaptive translation procedures in an experiment involving questionnaire translation. *International Journal of Sociology*, 51(2), 135-162.
<https://doi.org/10.1080/00207659.2020.1856541>
- Reser, J. P., & Bradley, G. L. (2017). *Fear appeals in climate change communication*. Oxford University Press.
- Reser, J. P., Bradley, G. L., & Ellul, M. C. (2014). Encountering climate change: 'seeing' is more than 'believing'. *WIREs Climate Change*, 5(4), 521-537.
<https://doi.org/10.1002/wcc.286>
- Reynolds, T. W., Bostrom, A., Read, D., & Morgan, M. G. (2010). Now what do people know about global climate change? Survey studies of educated laypeople. *Risk Analysis: An International Journal*, 30(10), 1520-1538.
<https://doi.org/10.1111/j.1539-6924.2010.01448.x>
- Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change. *The journal of psychology*, 91(1), 93-114.
<https://doi.org/10.1080/00223980.1975.9915803>
- Rogers, R. W. (1983). Cognitive and psychological processes in fear appeals and attitude change: A revised theory of protection motivation. In J. Cacioppo & R. Petty (Eds.), *Social psychophysiology: A sourcebook* (pp. 153-176). Guilford Press.
- Roser-Renouf, C., & Maibach, E. W. (2018). Strategic communication research to illuminate and promote public engagement with climate change. In D. A. Hope & R. A. Bevens (Eds.), *Change and Maintaining Change* (pp. 167-218). Springer International Publishing.

-
- Rudski, J. M., Osei, W., Jacobson, A. R., & Lynch, C. R. (2011). Would you rather be injured by lightning or a downed power line? Preference for natural hazards. *Judgment and Decision Making*, 6(4), 314-322.
<http://journal.sjdm.org/11/10809/jdm10809.pdf>
- Scherer, K. R. (1999). Appraisal theory. In T. Dalgleish & M. Power (Eds.), *Handbook of cognition and emotion*. (pp. 637-663). John Wiley & Sons Ltd.
- Schultz, P. W., Milfont, T. L., Chance, R. C., Tronu, G., Luís, S., Ando, K., Rasool, F., Roose, P. L., Ogunbode, C. A., Castro, J., & Gouveia, V. V. (2014). Cross-cultural evidence for spatial bias in beliefs about the severity of environmental problems. *Environment and Behavior*, 46(3), 267-302.
<https://doi.org/10.1177/0013916512458579>
- Sciberras, E., & Fernando, J. W. (2021). Climate change-related worry among Australian adolescents: an eight-year longitudinal study. *Child and Adolescent Mental Health*, 27(1), 22-29. <https://doi.org/10.1111/camh.12521>
- Shaffer, L. J., & Naiene, L. (2011). Why analyze mental models of local climate change? A case from Southern Mozambique. *Weather, Climate, and Society*, 3(4), 223-237. <https://doi.org/10.1175/wcas-d-10-05004.1>
- Shi, J., Visschers, V. H. M., Siegrist, M., & Arvai, J. (2016). Knowledge as a driver of public perceptions about climate change reassessed. *Nature Climate Change*, 6, 759. <https://dx.doi.org/10.1038/nclimate2997>
- Siegrist, M., & Sütterlin, B. (2014). Human and nature-caused hazards: The affect heuristic causes biased decisions. *Risk Analysis*, 34(8), 1482-1494.
<https://doi.org/10.1111/risa.12179>
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2011). False-positive psychology: Undisclosed flexibility in data collection and analysis allows presenting anything as significant. *Psychological Science*, 22(11), 1359-1366.
<https://doi.org/10.1177/0956797611417632>
- Sjöberg, L. (2000). Perceived risk and tampering with nature. *Journal of risk research*, 3(4), 353-367. <https://doi.org/10.1080/13669870050132568>
- Skre, I. B. (2022). angst [anxiety]. *Store medisinske leksikon på snl.no*. Retrived March 8th, 2022 <https://sml.snl.no/angst>

-
- Slovic, P. (1987). Perception of risk. *Science*, 236(4799), 280-285.
- Slovic, P. (1999). Trust, emotion, sex, politics, and science: surveying the risk-assessment battlefield. *Risk Analysis*, 19(4), 689-701.
<https://doi.org/10.1023/A:1007041821623>
- Smith, E. K., & Mayer, A. (2018). Anomalous Anglophones? Contours of free market ideology, political polarization, and climate change attitudes in English-speaking countries, Western European and post-Communist states. *Climatic Change*. <https://dx.doi.org/10.1007/s10584-018-2332-x>
- Smith, N., & Leiserowitz, A. (2012). The rise of global warming skepticism: Exploring affective image associations in the United States over time. *Risk Analysis*, 32(6), 1021-1032. <https://doi.org/10.1111/j.1539-6924.2012.01801.x>
- Smith, N., & Leiserowitz, A. (2014). The role of emotion in global warming policy support and opposition. *Risk Analysis*, 34(5), 937-948.
<https://doi.org/10.1111/risa.12140>
- Spence, A., Poortinga, W., & Pidgeon, N. (2012). The psychological distance of climate change. *Risk Analysis: An International Journal*, 32(6), 957-972.
<https://doi.org/10.1111/j.1539-6924.2011.01695.x>
- Steenjtes, K., Pidgeon, N. F., Poortinga, W., Corner, A. J., Arnold, A., Böhm, G., Mays, C., Poumadère, M., Ruddat, M., & Scheer, D. (2017). *European Perceptions of Climate Change (EPCC): Topline findings of a survey conducted in four European countries in 2016*. Cardiff University.
<https://orca.cardiff.ac.uk/98660/7/EPCC.pdf>
- Steg, L., & Vlek, C. (2009). Encouraging pro-environmental behaviour: An integrative review and research agenda. *Journal of Environmental Psychology*, 29(3), 309-317. <https://doi.org/10.1016/j.jenvp.2008.10.004>
- Sterman, J. D. (2008). Risk communication on climate: mental models and mass balance. *Science*, 322(5901), 532-533. <https://doi.org/10.1126/science.1162574>
- Sullivan, G. M., & Feinn, R. (2012). Using effect size-or why the P value is not enough. *Journal of graduate medical education*, 4(3), 279-282.
<https://doi.org/10.4300/JGME-D-12-00156.1>

-
- Sweeny, K., & Dooley, M. D. (2017). The surprising upsides of worry. *Social and Personality Psychology Compass*, *11*(4), e12311.
<https://doi.org/10.1111/spc3.12311>
- Swim, J. K., Clayton, S., Doherty, T., Gifford, R., Howard, G., Reser, J., Stern, P., & Weber, E. (2009). *Psychology and global climate change: Addressing a multi-faceted phenomenon and set of challenges. A report by the American Psychological Association's task force on the interface between psychology and global climate change*. American Psychological Association.
<https://www.apa.org/science/about/publications/climate-change>
- Swim, J. K., & Whitmarsh, L. (2018). Climate change as a unique environmental problem *Environmental Psychology* (pp. 26-35).
<https://doi.org/10.1002/9781119241072.ch3>
- Tam, K.-P., Leung, A. K. y., & Koh, B. (2022). Perceived cultural impacts of climate change motivate climate action and support for climate policy. *Climatic Change*, *171*(1), 12. <https://doi.org/10.1007/s10584-022-03337-8>
- Tannenbaum, M. B., Hepler, J., Zimmerman, R. S., Saul, L., Jacobs, S., Wilson, K., & Albarracín, D. (2015). Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychol Bull*, *141*(6), 1178-1204.
<https://doi.org/10.1037/a0039729>
- Tetlock, P. E., & Mitchell, G. (2015). Why so few conservatives and should we care? *Society*, *52*(1), 28-34. <https://doi.org/10.1007/s12115-014-9850-6>
- Thøgersen, J. (2014). The mediated influences of perceived norms on pro-environmental behavior. *Revue d'économie politique*, *124*(2), 179-193.
<https://doi.org/10.3917/redp.242.0179>
- Tobler, C., Visschers, V. H. M., & Siegrist, M. (2012). Consumers' knowledge about climate change. *Climatic Change*, *114*(2), 189-209.
<https://doi.org/10.1007/s10584-011-0393-1>
- Toke, D. (2005). Explaining wind power planning outcomes: some findings from a study in England and Wales. *Energy policy*, *33*(12), 1527-1539.
[https://doi.org/10.1016/S0301-4215\(04\)00017-5](https://doi.org/10.1016/S0301-4215(04)00017-5)

-
- Tranter, B. (2020). Does public knowledge of climate change really matter in Australia? *Environmental Communication*, 14(4), 537-554.
<https://doi.org/10.1080/17524032.2019.1696853>
- Truelove, H. B., & Gillis, A. J. (2018). Perception of pro-environmental behavior. *Global Environmental Change*, 49, 175-185.
<https://doi.org/10.1016/j.gloenvcha.2018.02.009>
- Tvinnereim, E., & Fløttum, K. (2015). Explaining topic prevalence in answers to open-ended survey questions about climate change. *Nature Climate Change*, 5(8), 744-747. <https://doi.org/10.1038/nclimate2663>
- Tvinnereim, E., Lægred, O. M., Liu, X., Shaw, D., Borick, C., & Lachapelle, E. (2020). Climate change risk perceptions and the problem of scale: evidence from cross-national survey experiments. *Environmental Politics*, 1-21.
<https://doi.org/10.1080/09644016.2019.1708538>
- Urban, J., & Ščasný, M. (2012). Exploring domestic energy-saving: The role of environmental concern and background variables. *Energy Policy*, 47, 69-80.
<https://doi.org/10.1016/j.enpol.2012.04.018>
- Van der Linden, S. (2015). A conceptual critique of the cultural cognition thesis. *Science Communication*, 38. <https://doi.org/10.1177/1075547015614970>
- Van der Linden, S. (2017). Determinants and measurement of climate change risk perception, worry, and concern. In M. S. M.C. Nisbet, E. Markowitz, S. Ho, S. O'Neill, J. Thaker (Ed.), *The Oxford Encyclopedia of Climate Change Communication*. Oxford University Press.
<https://www.oxfordreference.com/view/10.1093/acref/9780190498986.001.0001/acref-9780190498986-e-318>
- Van der Linden, S. (2021). The Gateway Belief Model (GBM): A review and research agenda for communicating the scientific consensus on climate change. *Current Opinion in Psychology*, 42, 7-12. <https://doi.org/10.1016/j.copsyc.2021.01.005>
- Van der Linden, S. (2022). Misinformation: susceptibility, spread, and interventions to immunize the public. *Nature Medicine*, 28(3), 460-467.
<https://doi.org/10.1038/s41591-022-01713-6>

-
- Van der Linden, S., Leiserowitz, A., & Maibach, E. (2017). Gateway illusion or cultural cognition confusion? *Journal of Science Communication*
<https://doi.org/10.17863/CAM.22574>
- Van der Linden, S., Leiserowitz, A., & Maibach, E. (2019). The gateway belief model: A large-scale replication. *Journal of Environmental Psychology*, 62, 49-58. <https://doi.org/10.1016/j.jenvp.2019.01.009>
- Van der Linden, S., Maibach, E., Cook, J., Leiserowitz, A., Ranney, M., Lewandowsky, S., Árvai, J., & Weber, E. U. (2017). Culture versus cognition is a false dilemma. *Nature Climate Change*, 7, 457.
<https://doi.org/10.1038/nclimate3323>
- Van Lange, P. A. M., & Huckelba, A. L. (2021). Psychological distance: How to make climate change less abstract and closer to the self. *Current Opinion in Psychology*, 42, 49-53. <https://doi.org/10.1016/j.copsyc.2021.03.011>
- Van Lange, P. A. M., Joireman, J., & Milinski, M. (2018). Climate change: What psychology can offer in terms of insights and solutions. *Current Directions in Psychological Science*, 27(4), 269-274.
<https://doi.org/10.1177/0963721417753945>
- Van Valkengoed, A. M., Perlaviciute, G., & Steg, L. (2022). Relationships between climate change perceptions and climate adaptation actions: policy support, information seeking, and behaviour. *Climatic Change*, 171(1), 14.
<https://doi.org/10.1007/s10584-022-03338-7>
- Van Valkengoed, A. M., & Steg, L. (2019). Meta-analyses of factors motivating climate change adaptation behaviour. *Nature Climate Change*, 9(2), 158-163.
<https://doi.org/10.1038/s41558-018-0371-y>
- Van Valkengoed, A. M., Steg, L., & Perlaviciute, G. (2021). Development and validation of a climate change perceptions scale. *Journal of Environmental Psychology*, 76, 101652. <https://doi.org/10.1016/j.jenvp.2021.101652>
- Verplanken, B., Marks, E., & Dobromir, A. I. (2020). On the nature of eco-anxiety: How constructive or unconstructive is habitual worry about global warming? *Journal of Environmental Psychology*, 72.
<https://doi.org/10.1016/j.jenvp.2020.101528>

-
- Verplanken, B., & Roy, D. (2013). "My worries are rational, climate change is not": Habitual ecological worrying is an adaptive response. *PLOS ONE*, 8(9).
<https://doi.org/10.1371/journal.pone.0074708>
- Verschoor, M., Albers, C., Poortinga, W., Böhm, G., & Steg, L. (2020). Exploring relationships between climate change beliefs and energy preferences: A network analysis of the European Social Survey. *Journal of Environmental Psychology*, 70. <https://doi.org/10.1016/j.jenvp.2020.101435>
- Vesely, S., & Klöckner, C. A. (2020). Social desirability in environmental psychology research: Three meta-analyses. *Frontiers in Psychology*, 11.
<https://doi.org/10.3389/fpsyg.2020.01395>
- von Stechow, C., Minx, J. C., Riahi, K., Jewell, J., McCollum, D. L., Callaghan, M. W., Bertram, C., Luderer, G., & Baiocchi, G. (2016). 2° C and SDGs: united they stand, divided they fall? *Environmental Research Letters*, 11(3).
<https://doi.org/10.1088/1748-9326/11/3/034022>
- Warriner, G. K., McDougall, G. H. G., & Claxton, J. D. (1984). Any data or none at all?: Living with inaccuracies in self-reports of residential energy consumption. *Environment and Behavior*, 16(4), 503-526.
<https://doi.org/10.1177/0013916584164005>
- Weidman, A. C., Steckler, C. M., & Tracy, J. L. (2017). The jingle and jangle of emotion assessment: Imprecise measurement, casual scale usage, and conceptual fuzziness in emotion research. *Emotion*, 17(2), 267-295.
<https://doi.org/10.1037/emo0000226>
- Whitmarsh, L. (2009). What's in a name? Commonalities and differences in public understanding of "climate change" and "global warming". *Public Understanding of Science*, 18(4), 401-420.
<https://doi.org/10.1177/0963662506073088>
- Whitmarsh, L., & Capstick, S. (2018). Perceptions of climate change. In S. Clayton & C. Manning (Eds.), *Psychology and climate change: Human perceptions, impacts, and responses* (pp. 13 - 33): Academic Press.
- Whittle, C., Haggard, P., Whitmarsh, L., Morgan, P., & Xenias, D. (2019). *Future of mobility: decision making in the UK transport system*. Government Office for

Science.

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/773667/decisionmaking.pdf

Witte, K. (1992). Putting the fear back into fear appeals: The extended parallel process model. *Communication Monographs*, 59(4), 329-349.

<https://doi.org/10.1080/03637759209376276>

Witte, K., & Allen, M. (2000). A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health education & behavior*, 27(5), 591-615. <https://doi.org/10.1177/109019810002700506>

Wolf, J., & Moser, S. C. (2011). Individual understandings, perceptions, and engagement with climate change: insights from in-depth studies across the world. *WIREs Climate Change*, 2(4), 547-569. <https://doi.org/10.1002/wcc.120>

Wong-Parodi, G., & Feygina, I. (2021). Engaging people on climate change: The role of emotional responses. *Environmental Communication*, 15(5), 571-593.

<https://doi.org/10.1080/17524032.2020.1871051>

Zawadzki, S. J., Bouman, T., Steg, L., Bojarskich, V., & Druen, P. B. (2020).

Translating climate beliefs into action in a changing political landscape.

Climatic Change, 161(1), 21-42. <https://doi.org/10.1007/s10584-020-02739-w>



Political Orientation Moderates the Relationship Between Climate Change Beliefs and Worry About Climate Change

Thea Gregersen^{1,2*}, Rouven Doran¹, Gisela Böhm^{1,3}, Endre Tvinnereim^{2,4} and Wouter Poortinga^{5,6}

¹ Department of Psychosocial Science, Faculty of Psychology, University of Bergen, Bergen, Norway, ² Centre for Climate and Energy Transformation, Faculty of Social Sciences, University of Bergen, Bergen, Norway, ³ Department of Psychology, Inland Norway University of Applied Sciences, Lillehammer, Norway, ⁴ Department of Administration and Organization Theory, Faculty of Social Sciences, University of Bergen, Bergen, Norway, ⁵ Welsh School of Architecture, College of Physical Sciences and Engineering, Cardiff University, Cardiff, United Kingdom, ⁶ School of Psychology, Cardiff University, Cardiff, United Kingdom

OPEN ACCESS

Edited by:

Cecilia Jakobsson Bergstad,
University of Gothenburg, Sweden

Reviewed by:

Louise Eriksson,
Umeå University, Sweden
José Gutiérrez-Pérez,
University of Granada, Spain

*Correspondence:

Thea Gregersen
Thea.Gregersen@uib.no

Specialty section:

This article was submitted to
Environmental Psychology,
a section of the journal
Frontiers in Psychology

Received: 03 February 2020

Accepted: 12 June 2020

Published: 16 July 2020

Citation:

Gregersen T, Doran R, Böhm G,
Tvinnereim E and Poortinga W (2020)
Political Orientation Moderates
the Relationship Between Climate
Change Beliefs and Worry About
Climate Change.
Front. Psychol. 11:1573.
doi: 10.3389/fpsyg.2020.01573

Public perceptions are well established as a key factor in support for climate change mitigation policies, and they tend to vary both within and between countries. Based on data from the European Social Survey Round 8 ($N = 44,387$), we examined the role of climate change beliefs and political orientation in explaining worry about climate change across 23 countries. We show that belief in anthropogenic climate change, followed by expectations of negative impacts from climate change, are the strongest predictors of worry about climate change. While the strength of the association between political orientation and worry about climate change varies across countries, self-positioning further to the right of the political spectrum is associated with lower levels of worry in most of the countries included in the analysis. We further show that political orientation moderates the relationship between climate change beliefs and worry. While increased confidence in the anthropogenic nature of climate change and expectations of negative impacts are both associated with increased worry across the political spectrum, the relationship is weaker among right-leaning as compared to left-leaning individuals. Notably, the main effect of political orientation on worry about climate change is no longer statistically significant when the interaction terms are present. Finally, a relatively small amount of the explained variance in worry is attributable to differences between countries. The findings might inform strategies for climate change communication in a European context.

Keywords: worry, beliefs, causes, impacts, climate change, political orientation

INTRODUCTION

Public acceptability is recognized as a key factor for the successful implementation of measures directed at tackling climate change (de Coninck et al., 2018). Understanding how individuals perceive climate change can thus be central to mobilizing support for climate policies. Previous research shows that the extent to which individuals worry about climate change can vary within

countries in regards to social, cognitive, and cultural factors (Van der Linden, 2017), but also across countries when considering the overall level of worry expressed by the general public (Poortinga et al., 2019). In addition, Poortinga et al. (2019) demonstrated that the predictive strength of socio-political and demographic variables in explaining concerns about climate change also differs across countries and regions. The present study builds upon that research to shed further light on how public perceptions of climate change interact with political orientation in a European context. In particular, we will focus on the relative importance of and interactions between climate change beliefs and political orientation in explaining worry about climate change.

Worry is one of several measures used to study climate change risk perception, sometimes interchangeably with the concepts of concern, perceived seriousness, and perceived risk. Van der Linden (2017) proposes that personal worry, generalized concern, perceived severity, and likelihood ratings are all components of a “hierarchy of concern,” and that personal worry is the preferred indicator if the goal is to understand the association with behavior and/or policy support. In line with this, Van der Linden et al. (2019) found that personal feelings of worry are associated with higher levels of support for public action on global warming and that this association is stronger for worry than for more cognitive judgments. Smith and Leiserowitz (2014) reported that worry is a far more important factor in support for climate mitigation policies than are sociodemographics, cultural worldviews, and other discrete emotions such as hope or anger. Consequently, identifying what makes individuals worry about climate change may help to provide a better understanding of public support and engagement with the issue.

One factor that is often associated with people’s level of worry is their beliefs about the causes and possible impacts of climate change, sometimes referred to as mental models (Bostrom, 2017). Previous research has shown that people are more likely to report concern about climate change when they think that humans are responsible for causing it (Lee et al., 2015; Shi et al., 2016), and to be more willing to engage in pro-environmental behaviors and to pay for policies when they think the consequences of climate change will be severe (Mayer and Smith, 2019). Beliefs about consequences for humans have been found to be central to environmental risk perceptions (Böhm and Pfister, 2001) and several experimental studies support that worry is an especially likely emotional reaction when focusing on possible negative consequences of environmental risks (Böhm, 2003; Böhm and Pfister, 2005). Tobler et al. (2012) reported that, out of several types of climate change knowledge, knowledge about causes was most strongly related to climate change concern. Furthermore, Böhm and Pfister (2017) found that human-caused risks are more strongly related to moral blameworthiness and emotions such as outrage than are natural risks, which suggests that causal attributions are important for evaluations and emotions relating to environmental risks, including climate change.

Another factor known to be associated with climate change perceptions is political orientation, which, according to McCright et al. (2016), constitutes one of the most important and consistent predictors of climate change perceptions such as worry and concern. A common approach to measuring political orientation

is to ask people to position themselves on a liberal versus conservative (in the United States; e.g., American National Election Studies) or a (political) left versus right (in Europe; e.g., European Social Survey) dimension. Research has found that left-leaning or liberal individuals are more likely to believe in the reality and anthropogenic nature of climate change, and to be worried about it, than those who identify themselves as right-leaning or conservative (for a review, see McCright et al., 2016).

Studies in which individuals place themselves on a liberal-conservative continuum support this relationship for belief in anthropogenic climate change (Hornsey et al., 2016) and environmental concern (Cruz, 2017; Leiserowitz et al., 2019). Most of these studies were conducted in the United States and report small- to medium-sized associations. Measuring political orientation on a left-right continuum in an international context, Kvaløy et al. (2012) as well as McCright et al. (2015) found that left-leaning individuals are more likely to perceive climate change as a serious problem. Doran et al. (2018) found that political orientation predicted support for climate policies, even when controlling for consequence beliefs and moral concerns about climate change. And Poortinga et al. (2019) found a clear and highly consistent negative association between right-leaning political orientation and climate change concern using the same data as used in this paper. Compared to studies from the United States, studies of European countries have generally reported weaker associations between political orientation and climate change views (McCright and Dunlap, 2011; McCright et al., 2015; Lewis et al., 2019). For example, Smith and Mayer (2018) report that the association between party affiliation, mapped on a left-right continuum to allow for comparisons across countries, and perceived danger from climate change is strongest in English-speaking countries, moderate in non-English-speaking Western European countries, and minimal in post-communist states. McCright et al. (2015) found a similar gap between Western European and former communist countries with regard to the association between political orientation and acceptance of anthropogenic climate change, perceived seriousness, and support for mitigation action.

The ideological differences in climate change concerns that have been identified in previous research may reflect motivated reasoning; a process where existing worldviews and desires influence how individuals interpret available information (Kunda, 1990; Campbell and Kay, 2014; Lewandowsky and Oberauer, 2016). In line with this, the theory of cultural cognition argues that worldviews can make individuals downplay or highlight risks, and generally perceive them differently (Kahan, 2012). These theories have often been used to explain a direct link between political orientation and climate change views, but they could also explain how political orientation may interact with climate change beliefs in shaping perceived risk. While climate skepticism has been found to be higher among right-leaning individuals (McCright et al., 2016) most people in Europe—whether left-leaning or right-leaning—report being at least partly aware of the anthropogenic causes and possible negative consequences of climate change (Steenjtes et al., 2017; Pohjolainen et al., 2018). However, political orientation is associated with different

values and goals (for a review, see Jost et al., 2009) and thus may direct how information about (the causes and consequences of) climate change are interpreted. While most people seem to acknowledge that climate change will have negative consequences across the world, this could be a more substantial source of concern for left-leaning individuals (usually connected to egalitarian values) as compared to right-leaning individuals (usually connected to individualistic values), as climate change poses a greater threat to the things they value (Steg and Sievers, 2000).

Previous research has shown that political orientation can moderate the relationship between education or self-reported understanding and climate change concern (for reviews, see Hamilton, 2011; McCright, 2011). For example, Hamilton (2008) found that concern about the impacts of climate change on the polar regions increased with higher levels of education for self-reported liberals, while it decreased for those who identified as conservative. Malka et al. (2009) found that higher levels of self-reported knowledge about climate change were related to increased concern among self-identified Democrats, while this was not the case for self-identified Republicans. Similarly, Guber (2013) found that party polarization regarding worry about climate change increased with a higher self-reported understanding of climate change. These studies indicate that individuals might filter information in a way that aligns with their ideology (McCright, 2011). However, this line of research has measured knowledge by asking respondents to indicate their subjective level of understanding, without tapping into the actual content of the knowledge. Sinatra and Seyranian (2015) argue that one can differentiate between unjustified beliefs and justified true beliefs (supported by scientific evidence and justified as knowledge). Neither self-reported understanding nor education necessarily means that the respondents hold justified true beliefs (knowledge) about climate change. While scientific information and education can shape beliefs, people's climate change beliefs might still differ from the scientific consensus. In the current paper, we focus on the interaction between political orientation and people's beliefs about the causes and consequences of climate change. While both left-leaning and right-leaning individuals might hold justified true beliefs about climate change, we argue that, as a result of motivated reasoning, such beliefs can lead to different reactions depending on a person's political orientation.

The present study adds to the literature addressing public perceptions of climate change in a European context. We expect that increased confidence in the anthropogenic nature of climate change, belief in negative impacts, and a left-leaning political orientation, are associated with higher levels of worry. In addition to this, we seek to investigate whether the associations between beliefs towards and worry about climate change are contingent on a person's political orientation. It is well established that left-leaning individuals are more likely to endorse responsibility for the environment as a moral value (Feinberg and Willer, 2013) and to have concerns about the consequences environmental problems can have on other human beings and on the natural environment itself (Swami et al., 2010). We assume that such differences in values and worldviews

may influence to what extent the anthropogenic causes and global consequences of climate change are deemed important for people's risk perception. Consequently, we expect a stronger relationship between climate change beliefs and worry for left-leaning than for right-leaning individuals. Accounting for possible cross-national differences, we expect the association between political orientation and worry about climate change to be stronger in Western Europe than in post-communist countries (Poortinga et al., 2019).

MATERIALS AND METHODS

Data Collection

This study utilizes data from Round 8 of the European Social Survey (2016). The data were collected in 2016–2017 through face-to-face interviews with $N = 44,387$ respondents from Israel and 22 European countries. Representative samples of the population aged 15+ years were drawn from each country, using strict random probability sampling. The mean age of the overall sample was 46.97 ($SD = 18.85$), with 48% males ($n = 24,916$) and 52% females ($n = 27,226$) when adjusted for post-stratification and population size weights. The items used in the analysis were taken from the core "Politics" module, as well as the rotating module on "Climate Change and Energy" that was included for the first time in Round 8 of the ESS. For more information on the data, see the documentation report (European Social Survey, 2018).

Measurements

The dependent variable of the analyses was self-reported worry about climate change, measured with one item. The respondents were asked to answer the question "How worried are you about climate change?" with response categories 1 (*Not at all worried*), 2 (*Not very worried*), 3 (*Somewhat worried*), 4 (*Very worried*), 5 (*Extremely worried*). No answer to the question and the category "Don't know" were set to missing ($n = 1733$).

Two questions were asked to assess people's climate change beliefs. Beliefs about the causes of climate change were measured by asking "Do you think that climate change is caused by natural processes, human activity, or both?" with answer categories 1 (*Entirely by natural processes*), 2 (*Mainly by natural processes*), 3 (*About equally by natural processes and human activity*), 4 (*Mainly by human activity*), or 5 (*Entirely by human activity*). No answer and the options "I don't think the climate is changing" ($n = 349$) and "Don't know" ($n = 2153$), were set to missing. The variable was treated as continuous and centered around the grand-mean of $M = 3.42$. Expectations about the severity of climate change impacts were assessed by asking "How good or bad do you think the impact of climate change will be on people across the world?" with an 11-point response scale ranging from 0 (*Extremely bad*) to 10 (*Extremely good*). The response scale was transformed into a dichotomous variable, coded as 0 (*Belief that the impacts will be good or neutral*), including answers from 0 to 5 on the reversed scale, and 1 (*Belief in mostly bad impacts*), including answers from 6 to 10

on the reversed scale¹. The category “Don’t know” and no answer was set to missing ($n = 3155$). Political orientation was measured by asking respondents: “In politics people sometimes talk of ‘left’ and ‘right.’ Using this card, where would you place yourself on this scale, where 0 means the left and 10 means the right?” The variable was grand-mean centered ($M = 5.16$). A total of 5804 respondents lacked an answer or were in the category “Don’t know,” which were set to missing. The shares of missing observations on the left-right scale variable were considerably higher in post-communist countries in Eastern and Central Europe than in the remainder of the sample. **Table 1** shows a correlation matrix for the outcome and the independent variables.

Age, education, and gender were included in the model as control variables based on associations found in previous studies (Marquart-Pyatt, 2008; Hornsey et al., 2016; Poortinga et al., 2019). Gender was dummy coded, with 0 referring to male and 1 to female. Age was treated as a categorical variable with 10-year intervals, centered on the grand-mean of $M = 49.14$. Education had seven categories, representing the highest level of completed education in line with the International Standard Classification of Education (ISCED). The categories were 1 (ES-ISCED I /less than lower secondary), 2 (ES-ISCED II/lower secondary), 3 (ES-ISCED IIIb/lower tier upper secondary), 4 (ES-ISCED IIIa/upper tier upper secondary), 5 (ES-ISCED IV/advanced vocational/sub-degree), 6 (ES-ISCED V1/lower tertiary education/BA level), and 7 (ES-ISCED V2/higher tertiary education/> = MA level). The variable was grand-mean centered at 4.01. **Table 2** shows descriptive statistics for the variables included in the analyses.

Statistical Analysis

Because people within a country tend to share some features, accounting for heterogeneous variance can help to gain a more accurate picture of residuals. Multilevel models (MLM) accomplish this by dividing the residual variance into within and between components (Rabe-Hesketh and Skrondal, 2012; Snijders and Bosker, 2012). We fitted random intercept and random slope models in order to examine the overall association and interactions between climate change beliefs, political orientation, and worry about climate change. The models comprise two levels that represent individuals (Level 1) nested within countries (Level 2) and were fitted by using the mixed command in Stata 15.

Four models were fitted. We started with an unconditional model (Null Model) followed by a random intercept model with individual-level variables (Model 1), a model that included the interactions (Model 2), and a model including a random slope for political orientation (Model 3). In random intercept models the regression coefficients are held constant across all groups (here: countries), while the intercepts are allowed to vary. This is different from random slope models, where the relationship between a predictor and the outcome is also allowed to vary between groups. In the MLM outlined above, it is possible

to predict intercepts and slopes for the countries included in the analysis. However, because countries are treated as random variables, the models cannot be used to compare actual results between the countries (Rabe-Hesketh and Skrondal, 2012, pp. 158–160). Instead of drawing inferences for specific countries included in our sample, we seek to generalize the findings to the total population.

Grand-mean centering was preferred to standardization in the main models because it does not affect the regression slopes and residual variances (Hox et al., 2017). We did, however, use standardization in additional models. The effect size measure R^2 cannot be directly applied to MLM. Instead, we calculated the proportional reduction of variance (PRV), which has been recommended to represent the strength of the relationship between variables in MLM (Rabe-Hesketh and Skrondal, 2012; Billett et al., 2014; Lorah, 2018). Interaction effects were plotted and interpreted by using the margins and marginsplot commands in Stata. Survey weights were not used in the MLM in order to keep the models parsimonious and comparable.

RESULTS

The amount of the variation in worry that is attributable to differences between countries was assessed by fitting a null model without any predictors. The intraclass correlation (ICC) indicated that about 6% of the total variance in individual-level worry about climate change is attributable to variation between countries $ICC = 0.06$, 95% CI [0.03, 0.10]. The ICC were calculated as the ratio of the country-level variance to the total variance: $ICC = \sigma^2_{country} / (\sigma^2_{country} + \sigma^2_{individual})$. Continuing with MLM rather than one-level models is recommended at this ICC level to account for a lack of independence (Bliese, 1998; Hox et al., 2017). The predicted country averages of worry about climate change are shown in **Figure 1**.

Results from likelihood ratio tests confirmed that the model with individual-level variables (Model 1) has a better fit than the unconditional (“null”) model $\chi^2(6) = 4821.69$, $p < 0.001$. Model 1 shows that belief in the anthropogenic nature of climate change and negative impacts on people across the world were associated with more worry, while right-leaning political orientation was associated with less worry (see **Table 3**).

A model including the interaction terms between climate change beliefs and political orientation (Model 2) further improved the fit, $\chi^2(2) = 63.58$, $p < 0.001$. The interactions between beliefs about climate change causes and political orientation and between expected climate change impacts and political orientation were both statistically significant. As seen in **Table 3**, the main effect of political orientation was no longer statistically significant after adding the interactions.

The final model (Model 3) included a random slope on political orientation, which again led to an improvement of model fit, $\chi^2(2) = 21.15$, $p < 0.001$. In this model, increased worry was predicted by belief in anthropogenic climate change and negative impacts. The main effect of political orientation was not statistically significant, just as in Model 2. The interaction between beliefs about climate change causes and political

¹Belief about climate change impacts was dichotomized as this study aimed to distinguish those who think that climate change will have mainly negative impacts from those who believe in either neutral or mainly positive impacts.

TABLE 1 | Correlation matrix.

	Worry about climate change	Climate change attribution	Climate change impact	Political orientation
Worry about climate change	1.00			
Climate change attribution	0.30**	1.00		
Climate change impact	0.29**	0.24**	1.00	
Political orientation	-0.11**	-0.10**	-0.12**	1.00

**Correlation is statistically significant at the 0.01 level (two-tailed). Weighted with a combination of post-stratification weight and population weight.

TABLE 2 | Descriptive Statistics for variables in the study.

Individual-level (N = 44 387)	M	SD	Min	Max
Worry about climate change (1 = Not at all worried; 5 = Extremely worried)	3.06	0.94	1	5
Climate change attribution (1 = Entirely by natural processes; 5 = Entirely by human activity)	3.42	0.83	1	5
Climate change impact (0 = Extremely good; 10 = Extremely bad)	6.80	2.19	0	10
Political orientation (0 = Left; 10 = Right)	4.99	2.18	0	10
Age	46.97	18.85	15	100
Gender (Female)	0.52	0.50	0	1
Education	3.78	1.82	1	7

Country-level (N = 23)

All variables are weighted with a combination of post-stratification weight and population weight.

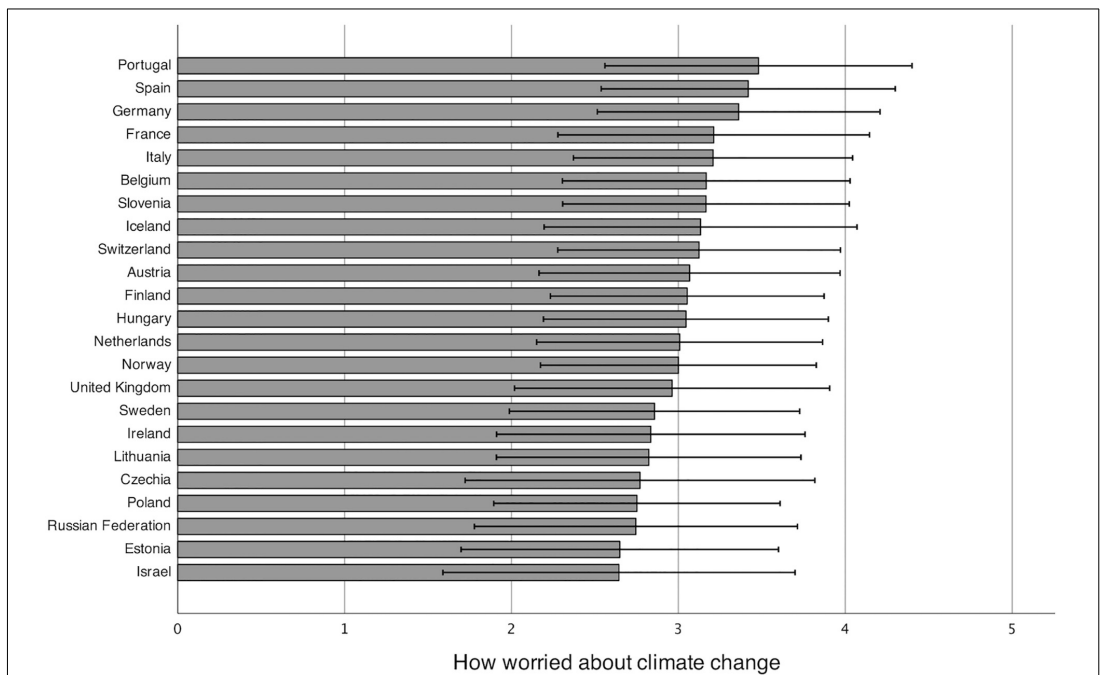


FIGURE 1 | Mean worry by country. Weighted with a combination of post-stratification weight and population weight.

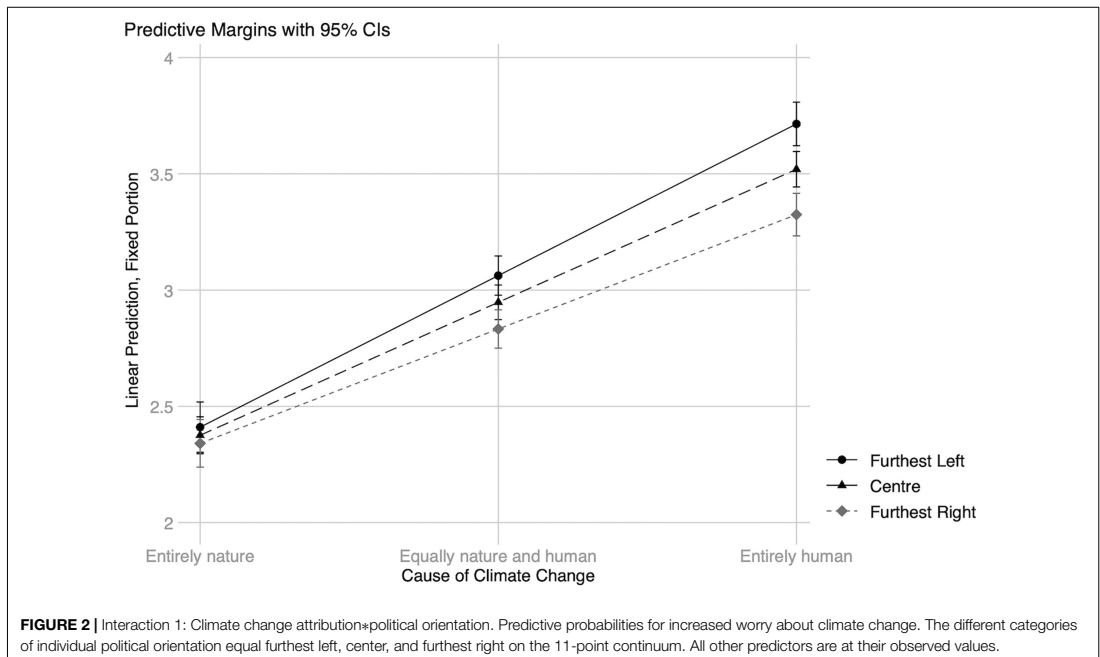
orientation and between beliefs about climate change impacts and political orientation were both still statistically significant. The intercept-slope covariance was not statistically significant,

thus including the correlation estimate did not improve the model. The effects of the three control variables age, gender, and education were highly consistent throughout the models.

TABLE 3 | Model results.

	Null Model	Model 1 (Level 1 variables)	Model 2 (interactions)	Model 3 (random slope)
	B (SE)	B (SE)	B (SE)	B (SE)
Fixed coefficients				
Intercept	3.07 (0.05)	2.78 (0.04)	2.77 (0.04)	2.78 (0.04)
Climate change attribution		0.29 (0.01)***	0.29 (0.01)***	0.28 (0.01)***
Climate change impact		0.31 (0.01)***	0.32 (0.01)***	0.32 (0.01)***
Political orientation		-0.03 (0.00)***	-0.01 (0.00)	-0.01 (0.00)
Climate change attribution*political orientation			-0.01 (0.00)**	-0.01 (0.00)**
Climate change impact*political orientation			-0.03 (0.00)***	-0.03 (0.00)***
Age		0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Gender (Female)		0.12 (0.01)***	0.12 (0.01)***	0.12 (0.01)***
Education		0.02 (0.00)***	0.02 (0.00)***	0.02 (0.00)***
Random parameters (error variance)				
Level 2: Country	0.05 (0.01)	0.03 (0.01)	0.03 (0.01)	0.03 (0.01)
Level 2: Political orientation				0.00 (0.00)
Level 1: Individual	0.77 (0.01)	0.68 (0.01)	0.67 (0.01)	0.67 (0.01)
Log likelihood	-46,111.858	-43,701.011	-43,669.223	-43,658.649
AIC	92,229.72	87,420.03	87,360.45	87,343.3
Variance explained by covariates	ICC = 0.06, 95% CI [0.03,0.10]	Pseudo $R^2 = 0.138$ $R_2^2 = 0.329$ $R_1^2 = 0.126$	Pseudo $R^2 = 0.140$ $R_2^2 = 0.332$ $R_1^2 = 0.128$	Pseudo $R^2 = 0.141$ $R_2^2 = 0.334$ $R_1^2 = 0.129$ ICC = 0.05, 95% CI [0.03,0.08]

All variables are grand-mean centered, except gender (0 = Male; 1 = Female) and impact (0 = Good; 1 = Bad). **Statistically significant at the $p = 0.001$ level, ***statistically significant at the $p < 0.001$ level. Total R -squared and separate reduction of variance are calculated following the method used in Rabe-Hesketh and Skrondal (2012). $N = 35,690$ individuals, $N = 23$ countries.



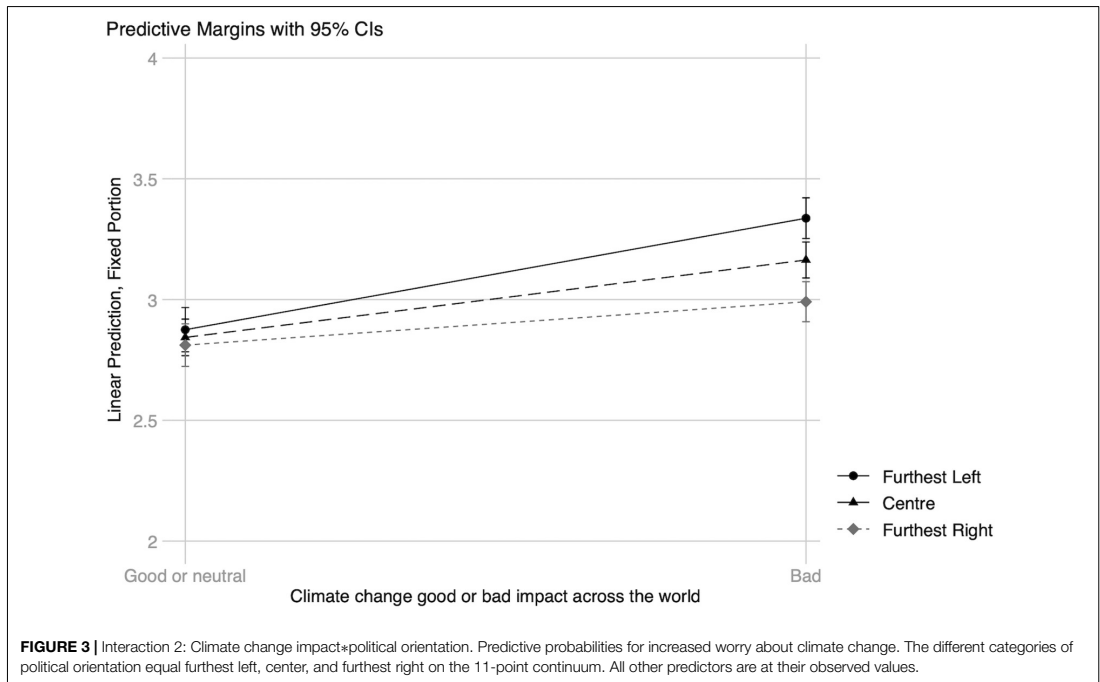


Table 3 shows that age was not statistically significant in any of the models, while higher levels of education were related to increased worry and women were more worried than men across all models.

The interaction between political orientation and beliefs about climate change causes (see **Figure 2**) suggests that thinking that climate change is caused by human activity is associated with increased worry, independently of political orientation. The relationship was statistically significant for individuals furthest left ($B = 0.33$ (0.01), $z = 22.81$, $p < 0.001$ CI [0.30, 0.35]), center ($B = 0.29$ (0.01), $z = 48.68$, $p < 0.001$ CI [0.27, 0.30]), and furthest right ($B = 0.25$ (0.01), $z = 18.75$, $p < 0.001$ CI [0.22, 0.27]) on the spectrum. However, the strongest effect was found for those furthest left, followed by center and furthest right. There were no differences in worry between the three groups for individuals who believe climate change is caused entirely by natural processes.

The interaction between political orientation and climate change impacts (see **Figure 3**) indicate that there is no difference in worry between people who place themselves on the political scale furthest to the left, center, or furthest to the right if they believe that the impacts of climate change will be neutral or mostly good. In contrast, worry increased for all three groups when individuals believe that the impacts will be negative across the world, and a gap between the political positions becomes apparent. The positive relationship between belief in negative impacts and worry about climate change was largest for people furthest to the left ($B = 0.46$ (0.03), $z = 17.58$, $p < 0.001$, CI [0.41,

0.51]), followed by people in the center ($B = 0.32$ (0.01), $z = 31.61$, $p < 0.001$, CI [0.30, 0.34]), and smallest for people furthest to the right ($B = 0.18$ (0.02), $z = 7.65$, $p < 0.001$, CI [0.13, 0.23]).

Figure 4 shows the predicted slopes for political orientation across countries, with all covariates included in the model. The random slopes can be thought of as an interaction between individual-level political orientation and country. The figure shows that the effect of right-leaning political orientation on worry is negative across most countries, but the strength of the effect varies. Consistent with our expectations, the relationship is generally stronger for Western European countries compared to post-communist states. In Italy and some of the post-communist countries, the slopes indicate a positive relationship.

In order to get comparable effect sizes, we refitted Model 1 with standardized versions of the predictors. Standardization was done following recommendations for calculating effect sizes for fixed effects in MLM (Lorah, 2018). The standardized coefficient for climate change causation was $\beta = 0.23$ ($p < 0.001$), for belief in negative impacts $\beta = 0.14$ ($p < 0.001$), and for political orientation $\beta = -0.06$ ($p < 0.001$), education ($\beta = 0.05$, $p < 0.001$), and gender ($\beta = 0.06$, $p < 0.001$). The same pattern was found in the final model (Model 3), where the standardized coefficient for climate change causes were $\beta = 0.23$ ($p < 0.001$), for belief in negative impacts $\beta = 0.14$ ($p < 0.001$), and for political orientation $\beta = -0.08$ ($p < 0.001$), education ($\beta = 0.04$, $p < 0.001$), and gender ($\beta = 0.06$, $p < 0.001$). In addition to standardization, effect sizes were indicated by

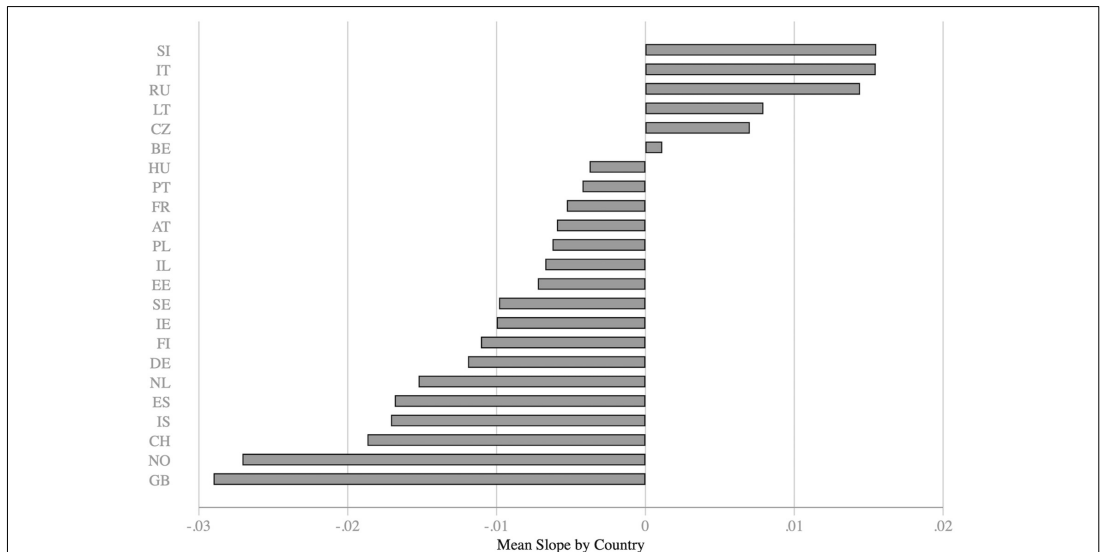


FIGURE 4 | Predicted average slope of political orientation on worry about climate change for each country combined with country-specific intercepts. Austria AT, Belgium BE, Switzerland CH, Czech Republic CZ, Germany DE, Estonia EE, Spain ES, Finland FI, France FR, United Kingdom GB, Hungary HU, Ireland IE, Israel IL, Iceland IS, Italy IT, Lithuania LT, Netherlands NL, Norway NO, Poland PL, Portugal PT, Russian Federation RU, Sweden SE, Slovenia SI.

the PRV for each predictor, $PRV = (\text{var}_{\text{model excluding one predictor}} - \text{var}_{\text{model including all predictors}}) / \text{var}_{\text{model excluding one predictor}}$ (Billett et al., 2014). The results from refitting Model 1 three times, each time excluding one of the main predictors, indicated that beliefs about climate change causes had the biggest impact out of the covariates ($PRV = 0.07$), followed by belief in negative impacts ($PRV = 0.03$). Political orientation did not have a measurable distinct direct contribution. The same results was found for Model 3.

The overall PRV is here referred to as Pseudo R^2 and calculated by following the recommendations from Rabe-Hesketh and Skrondal (2012). By first comparing the unconditional model with Model 1, we see that the covariates in total explained about 14% of the variance in worry about climate change (Total Pseudo $R^2 = 0.138$). The final model (Model 3), including interactions and a random slope, still explained approximately 14% of the variance (Total Pseudo $R^2 = 0.141$).

In the final model, about 5% of the variance in worry was attributable to differences between countries $ICC = 0.05$, 95% CI [0.03, 0.08] compared to 6% in the Null Model $ICC = 0.06$, 95% CI [0.03, 0.10]. This means that compositional differences in the individual-level variables explained only a small amount of Level 2 variance.

DISCUSSION

This study examined the overall association between belief in anthropogenic climate change, impact evaluations, political

orientation on the one hand and worry about climate change on the other. Because climate change risk perception might be influenced by country-contexts, we further explored possible group effects. Our results indicate that differences between countries explain a relatively small proportion of worry about climate change. One reason might be that there is too much variation within countries to reveal strong contextual effects. For example, prior research has found regional differences in actual and perceived vulnerability to climate change impacts, such as flooding (Brody et al., 2008). This implies that smaller areas, such as municipality or city, might be more suitable to account for possible cluster differences.

In line with prior studies (Lee et al., 2015; Shi et al., 2016), our results indicate that recognizing the human causes of climate change predicts worry. This could be because risks perceived to be human-caused are associated with greater feelings of moral responsibility compared to naturally occurring risks (Böhm and Pfister, 2017). According to the standardized coefficients and the PRV, beliefs about climate change causes had the largest effect out of the predictors. The second largest effect was that of belief in negative impacts. The results showed a positive relationship between belief in negative impacts of climate change and reported levels of worry, which supports prior findings (Böhm and Pfister, 2005; Mayer and Smith, 2019). Research conducted on the concept of psychological distance has indicated that asking about impacts “on people across the world” can have a weaker relation to worry compared to questions about impacts that are geographically and socially close (Spence et al., 2012). It is

thus possible that the strength of the relationship between belief in negative impacts and worry about climate change would have been stronger if the question had been framed differently.

Moreover, the predictive power of climate change beliefs on worry was substantially stronger compared to differences in political orientation. The fact that the strength of the association between political orientation and worry differs across countries is likely a partial explanation for the weaker main effect. It should be noted that even though the effect varies, the results indicate that the direction of the relationship is consistent across most countries. Specifically, individuals located further right on the political spectrum generally report being less worried than those further to the left. The reason for the cross-national variation could be explained with the anti-reflexivity thesis, which can also explain why political orientation seems to have more predictive power in the United States (McCright, 2011; McCright et al., 2016) compared to Europe (McCright et al., 2015; Smith and Mayer, 2018; Poortinga et al., 2019).

The anti-reflexivity thesis, often used to explain climate change skepticism, upholds that right-leaning individuals, organizations, and political parties seek to defend the capitalist system, which can be threatened by the need for climate change mitigation (McCright, 2016). Conservative think tanks and anti-reflexivity movements have been especially visible and robust in the United States (McCright et al., 2016). A consequence of these movements could be perceptions of weaker social and scientific consensus concerning the causes and possible consequences of climate change. This is important because prior research indicates that perceived consensus can reduce the gap in reported worry about climate change between the political left and right. For example, Goldberg et al. (2019) found that the relationship between conservative leanings and self-reported worry was, while still existent, substantially less negative for individuals that reported high social consensus among family and friends. Similar results have been found for perceived scientific consensus (Van der Linden et al., 2019).

The fact that the direct association between political orientation and worry is no longer statistically significant when the interactions are present indicates that, rather than it having a direct influence, political orientation alters the relationship between climate change beliefs and worry. Our results show that belief in anthropogenic climate change and its negative impacts on people across the world is more strongly related to worry for left-leaning individuals than for right-leaning individuals. The differences are in line with motivated reasoning, and are plausible when considering typical interests, values, and worldviews within left-leaning versus right-leaning political orientation (Jost et al., 2003; Jost et al., 2009; Balliet et al., 2018). For example, asking specifically for possible *worldwide* consequences of climate change could prime egalitarian values often related to the political left, as opposed to the more individualistic values found on the political right. Consequently, left-leaning individuals might emphasize global risks more than those furthest right on the political spectrum. In line with this, Hart and Nisbet (2012) found that messages that include social distance cues can increase polarization in policy preferences. While positive attitudes toward climate change mitigation policies were independent of

whether the potential victims were local or foreign for self-identified Democrats, high social distance reduced policy support among self-identified Republicans. It is important to mention that, though somewhat weaker, the relationship between climate change beliefs and worry are still positive also for right-leaning individuals. Further, there are no differences between the political groups for individuals that believe either that the causation of climate change is entirely natural, or that the impacts will be neutral or good.

Future research including political orientation may need to consider more closely what is meant by “left” and “right” because the effect of political orientation might depend on what these labels represent. The meaning of the labels may vary across countries and even across different groups within countries, and they may signify variation on different dimensions. For example, Caughey et al. (2019) distinguish between economic, social, and immigration-related conservatism and progressivism in Europe, and find that on average, citizens of Northern Europe tend to be more progressive (left-leaning) on immigration and social issues but more conservative (right-leaning) on economic issues than their Southern and Eastern European counterparts. The cross-country difference found in the present study, and previously by Smith and Mayer (2018) and McCright et al. (2015) may thus in part relate to the fact that the left-right scale structures party competition in different countries in different ways. More specifically, the difference between post-communist countries and other democracies may be due to a potentially weaker role of ideological debate along a left-right scale. The data on the share of respondents positioning themselves on a left-right scale suggest a somewhat lower relevance of the left-right scale in Eastern European countries than in Western Europe (Dalton et al., 2011). This is an important limitation because whether respondents think of left and right in economic rather than social terms may matter for the effect of this construct on their perceptions about climate change.

Some other limitations of the current study should be noted, especially in terms of measurement. First, the reported analyses employed single-item measures for the investigated constructs, which can influence their validity. From a theoretical perspective, worry is a personal emotional reaction to a perceived threat and should motivate behavior aimed at reducing the risk (Smith and Leiserowitz, 2014; Van der Linden, 2017). Our findings do not provide any details about what aspects or impacts of climate change people worry about, and whether this differs within or across countries. Previous research has shown that group membership can influence perceptions of environmental issues (Song et al., 2020) and it is likely that left-leaning and right-leaning individuals may worry about different threats. Further, the data provide no insights into how individuals prioritize the issue of climate change compared to other societal issues. Studies using open-ended and unprompted questions to investigate the relative importance of climate change have found climate change to have a relatively low relevance compared to other issues, and that its importance differs across countries (Steenjtes et al., 2017). An unspecific understanding of what it means when people say they are “worried” about climate change may limit the practical relevance of the relationship between climate change beliefs

and worry. Finally, since the reported analyses were based on cross-sectional data, interpretations about causal directions of the identified relationships have to be made with caution. For example, the relationship between climate change beliefs and worry could be spurious, with a confounding factor explaining their association. Furthermore, while the current paper assumes that climate change beliefs affect worry, it is also possible that worry affects climate change beliefs. Worrying about climate change may stimulate information seeking (Mead et al., 2012) which could increase knowledge about the causes and impacts of climate change. We thus see the investigation of the content of people's worries and the direction of the relationship between beliefs and worry as fruitful avenues for future research.

CONCLUSION

The current study finds that political orientation alters the association between climate change beliefs and worry. Specifically, believing that climate change is caused by humans and will have negative impacts across the world is a more potent source of worry for left-leaning than for right-leaning individuals. The findings might help inform strategies for international climate communication. While focusing on more knowledge and acceptance of anthropogenic climate change remains an important factor across European countries, relying solely on an increase in information is likely not the most effective measure. Instead, communication efforts should take into account that political orientation might influence how beliefs about the causes and consequences of climate change relate to worry. One way to deal with this is to consider relevant worldviews and values within different political orientations and tailor messages accordingly. For example, if the goal is to target individuals with a right-leaning political orientation, focusing on the possible economic or local consequences of climate change might work better than global framings. Further, such climate change information might be more effective if communicated and supported by diverse political elites and advocacy groups (Brulle et al., 2012). Previous research suggests that perceived consensus is highly relevant and that messages about social and scientific consensus can affect worry both directly and indirectly through increased confidence in the anthropogenic character of climate change (Van der Linden et al., 2015, 2019).

REFERENCES

Balliet, D., Tybur, J. M., Wu, J., Antonellis, C., and Van Lange, P. A. M. (2018). Political ideology, trust, and cooperation: in-group favoritism among republicans and democrats during a US National Election. *J. Conflict Resolut.* 62, 797–818. doi: 10.1177/0022002716658694

Billett, S., Harteis, C., and Gruber, H. (2014). *International Handbook of Research in Professional and Practice-Based Learning*. Berlin: Springer.

Bliese, P. D. (1998). Group size, ICC values, and group-level correlations: a simulation. *Organ. Res. Methods* 1, 355–373. doi: 10.1177/109442819814001

DATA AVAILABILITY STATEMENT

Publicly available datasets were analyzed in this study. The data can be found here: <https://www.europeansocialsurvey.org/data/download.html?r=8>.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by ESS ERIC Research Ethics Committee (REC). In accordance with the ESS ERIC Statutes (Article 23.3), the ESS ERIC subscribes to the Declaration on Professional Ethics of the International Statistical Institute. Written informed consent to participate in the study was given by all participants, and was provided by the participants' legal guardian/next of kin if the respondent was under 16 years of age at the time of the interview.

AUTHOR CONTRIBUTIONS

WP and GB were part of the team that designed the climate and energy module of European Social Survey Round 8. TG performed the data analysis and wrote the first draft of the manuscript. All authors contributed to the conception and design of the data analysis and the writing and revisions of the manuscript, and read and approved the final manuscript.

FUNDING

The European Social Survey (ESS) is a European Research Infrastructure Consortium (ERIC). Each participating country contributes to the central coordination costs of the ESS ERIC, in addition to funding their own costs of national fieldwork and national coordination.

ACKNOWLEDGMENTS

We want to thank Aimondas Ibenskas and Eva Richer for valuable comments on an earlier draft of this manuscript. Preliminary analyses were presented at the International Conference on Environmental Psychology (ICEP) in Plymouth, United Kingdom, 4–6 September 2019.

Böhm, G. (2003). Emotional reactions to environmental risks: consequentialist versus ethical evaluation. *J. Environ. Psychol.* 23, 199–212. doi: 10.1016/S0272-4944(02)00114-7

Böhm, G., and Pfister, H.-R. (2001). Mental representation of global environmental risks. *Environ. Risks* 9, 1–30. doi: 10.1016/S0196-1152(01)80022-3

Böhm, G., and Pfister, H.-R. (2005). Consequences, morality, and time in environmental risk evaluation. *J. Risk Res.* 8, 461–479. doi: 10.1080/13669870500064143

Böhm, G., and Pfister, H.-R. (2017). The perceiver's social role and a risk's causal structure as determinants of environmental risk evaluation. *J. Risk Res.* 20, 732–759. doi: 10.1080/13669877.2015.1118148

Bostrom, A. (2017). "Mental models and risk perceptions related to climate change," in *Oxford Research Encyclopedias*, eds M. C. Nisbet, S. S. Ho, E. Markowitz, S. O'Neill, M. S. Schäfer, and J. Thaker (Oxford: Oxford University Press), doi: 10.1093/acrefore/9780190228620.013.303

Brody, S. D., Zahran, S., Veldtitz, A., and Grover, H. (2008). Examining the relationship between physical vulnerability and public perceptions of global climate change in the United States. *Environ. Behav.* 40, 72–95. doi: 10.1177/0013916506298800

Brulle, R. J., Carmichael, J., and Jenkins, J. C. (2012). Shifting public opinion on climate change: an empirical assessment of factors influencing concern over climate change in the U.S., 2002–2010. *Clim. Change* 114, 169–188. doi: 10.1007/s10584-012-0403-y

Campbell, T. H., and Kay, A. C. (2014). Solution aversion: on the relation between ideology and motivated disbelief. *J. Pers. Soc. Psychol.* 107:809. doi: 10.1037/a0037963

Caughey, D., O'Grady, T. O. M., and Warshaw, C. (2019). Policy Ideology in European Mass Publics, 1981–2016. *Am. Polit. Sci. Rev.* 113, 674–693. doi: 10.1017/S0003055419000157

Cruz, S. M. (2017). The relationships of political ideology and party affiliation with environmental concern: a meta-analysis. *J. Environ. Psychol.* 53, 81–91. doi: 10.1016/j.jenvp.2017.06.010

Dalton, R. J., Farrell, D. M., and McAllister, I. (2011). *Political Parties and Democratic Linkage: How Parties Organize Democracy*. Oxford: Oxford University Press.

de Coninck, H., Revi, A., Babiker, M., Bertoldi, P., Buckering, M., Cartwright, A., et al. (2018). "Strengthening and implementing the global response," in *Global Warming of 1.5°C. An IPCC Special Report on the Impacts of Global Warming of 1.5°C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, eds V. Masson-Delmotte, P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P. R. Shukla, et al. (in press). Available online at: <https://www.ipcc.ch/sr15/chapter/chapter-4/>.

Doran, R., Böhm, G., Pfister, H.-R., Steentjes, K., and Pidgeon, N. (2018). Consequence evaluations and moral concerns about climate change: insights from nationally representative surveys across four European countries. *J. Risk Res.* 22, 610–626. doi: 10.1080/13669877.2018.1473468

European Social Survey. (2016). *Data file edition 2.0. NSD - Norwegian Centre for Research Data, Norway - Data Archive and distributor of ESS data for ESS ERIC*. London: ESS ERIC.

European Social Survey, (2018). *ESS Round 8 (2016/2017) Technical Report*. London: ESS ERIC.

Feinberg, M., and Willer, R. (2013). The moral roots of environmental attitudes. *Psychol. Sci.* 24, 56–62. doi: 10.1177/0956797612449177

Goldberg, M. H., van der Linden, S., Leiserowitz, A., and Maibach, E. (2019). Perceived social consensus can reduce ideological biases on climate change. *Environ. Behav.* 0, 0013916519853302. doi: 10.1177/0013916519853302

Guber, D. L. (2013). A cooling climate for change? party polarization and the politics of global warming. *Am. Behav. Sci.* 57, 93–115. doi: 10.1177/0002764212463361

Hamilton, L. C. (2008). Who cares about polar regions? Results from a survey of US public opinion. *Arctic Antarctic Alpine Res.* 40, 671–678. doi: 10.1657/1523-0430(07-105)[hamilton]2.0.co;2

Hamilton, L. C. (2011). Education, politics and opinions about climate change evidence for interaction effects. *Clim. Change* 104, 231–242. doi: 10.1007/s10584-010-9957-8

Hart, P. S., and Nisbet, E. (2012). Boomerang effects in science communication: how motivated reasoning and identity cues amplify opinion polarization about climate mitigation policies. *Commun. Res.* 39, 701–723. doi: 10.1177/0093650211416646

Hornsey, M. J., Harris, E. A., Bain, P. G., and Fielding, K. S. (2016). Meta-analyses of the determinants and outcomes of belief in climate change. *Nat. Clim. Change* 6:622. doi: 10.1038/nclimate2943

Hox, J. J., Moerbeek, M., and Van de Schoot, R. (2017). *Multilevel Analysis: Techniques and Applications, 3rd Edn*. New York, NY: Routledge.

Jost, J. T., Federico, C. M., and Napier, J. L. (2009). Political ideology: its structure, functions, and elective affinities. *Annu. Rev. Psychol.* 60, 307–337. doi: 10.1146/annurev.psych.60.110707.163600

Jost, J. T., Glaser, J., Kruglanski, A. W., and Sulloway, F. J. (2003). Political conservatism as motivated social cognition. *Psychol. Bull.* 129, 339–375. doi: 10.1037/0033-2909.129.3.339

Kahan, D. M. (2012). "Cultural cognition as a conception of the cultural theory of risk," in *Handbook of Risk Theory*, eds S. Roeser, R. Hillerbrand, P. Sandin, and M. Peterson (Dordrecht: Springer), 725–759. doi: 10.1007/978-94-007-1433-5_28

Kunda, Z. (1990). The case for motivated reasoning. *Psychol. Bull.* 108, 480–498. doi: 10.1037/0033-2909.108.3.480

Kvaloy, B., Finseraas, H., and Listhaug, O. (2012). The publics' concern for global warming: a cross-national study of 47 countries. *J. Peace Res.* 49, 11–22. doi: 10.1177/0022343311425841

Lee, T. M., Markowitz, E. M., Howe, P. D., Ko, C.-Y., and Leiserowitz, A. A. (2015). Predictors of public climate change awareness and risk perception around the world. *Nat. Clim. Change* 5:1014. doi: 10.1038/nclimate2728

Leiserowitz, A., Maibach, E., Rosenthal, S., Kotcher, J., Ballew, M., Goldberg, M., et al. (2019). *Politics & Global Warming, April 2019*. Yale University and George Mason University. New Haven: CT: Yale Program on Climate Change Communication.

Lewandowsky, S., and Oberauer, K. (2016). Motivated rejection of science. *Curr. Direct. Psychol. Sci.* 25, 217–222. doi: 10.1177/0963721416654436

Lewis, G. B., Palm, R., and Feng, B. (2019). Cross-national variation in determinants of climate change concern. *Environ. Politics* 28, 793–821. doi: 10.1080/09644016.2018.1512261

Lorah, J. (2018). Effect size measures for multilevel models: definition, interpretation, and TIMSS example. *Large Scale Assess. Educ.* 6:8. doi: 10.1186/s40536-018-0061-2

Malka, A., Krosnick, J. A., and Langer, G. (2009). The association of knowledge with concern about global warming: trusted information sources shape public thinking. *Risk Anal.* 29, 633–647. doi: 10.1111/j.1539-6924.2009.01220.x

Marquart-Pyatt, S. T. (2008). Are there similar sources of environmental concern? Comparing Industrialized Countries. *Soc. Sci. Q.* 89, 1312–1335. doi: 10.1111/j.1540-6237.2008.00567.x

Mayer, A., and Smith, E. K. (2019). Unstoppable climate change? The influence of fatalistic beliefs about climate change on behavioural change and willingness to pay cross-nationally. *Clim. Policy* 19, 511–523. doi: 10.1080/14693062.2018.1532872

McCright, A. M. (2011). Political orientation moderates Americans' beliefs and concern about climate change. *Clim. Change* 104, 243–253. doi: 10.1007/s10584-010-9946-y

McCright, A. M. (2016). Anti-reflexivity and climate change skepticism in the US general public. *Hum. Ecol. Rev.* 22, 77–108. doi: 10.4225/13/58213a5387787

McCright, A. M., Dunlap, R., and Marquart-Pyatt, S. T. (2015). Political ideology and views about climate change in the European Union. *Environ. Politics* 25, 1–21. doi: 10.1080/09644016.2015.1090371

McCright, A. M., and Dunlap, R. E. (2011). The politicization of climate change and polarization in the American public's views of global warming, 2001–2010. *Sociol. Q.* 52, 155–194. doi: 10.1111/j.1533-8525.2011.01198.x

McCright, A. M., Marquart-Pyatt, S. T., Shwom, R., Brechin, S., and Allen, S. (2016). Ideology, capitalism, and climate: explaining public views about climate change in the United States. *Clim. Vulture* 21, 180–189. doi: 10.1016/j.jers.2016.08.003

Mead, E., Roser-Renouf, C., Rimal, R. N., Flora, J. A., Maibach, E. W., and Leiserowitz, A. (2012). Information seeking about global climate change among adolescents: the role of risk perceptions, efficacy beliefs, and parental influences. *Atlantic J. Commun.* 20, 31–52. doi: 10.1080/15456870.2012.637027

Pohjolainen, P., Kukkonen, L., Jokinen, P., Poortinga, W., and Umit, R. (2018). *Public Perceptions on Climate Change and Energy in Europe and Russia*. Northampton Square: University of London.

Poortinga, W., Whitmarsh, L., Steg, L., Böhm, G., and Fisher, S. (2019). Climate change perceptions and their individual-level determinants: a cross-European analysis. *Glob. Environ. Change* 55, 25–35. doi: 10.1016/j.gloenvcha.2019.01.007

- Rabe-Hesketh, S., and Skrondal, A. (2012). *Multilevel and Longitudinal Modeling Using Stata*, 3rd Edn. College Station, TX: Stata Press.
- Shi, J., Visschers, V. H. M., Siegrist, M., and Arvai, J. (2016). Knowledge as a driver of public perceptions about climate change reassessed. *Nat. Clim. Change* 6:759. doi: 10.1038/nclimate2997
- Sinatra, G., and Seyranian, V. (2015). "Warm change about hot topics: the role of motivation and emotion in attitude and conceptual change about controversial science topics," in *Handbook of Educational Psychology*, 3rd Edn, eds L. Corno, and E. Anderman, (Abingdon: Routledge), 245–256.
- Smith, E. K., and Mayer, A. (2018). Anomalous Anglophones? Contours of free market ideology, political polarization, and climate change attitudes in English-speaking countries, Western European and post-Communist states. *Clim. Change* 152, 17–34. doi: 10.1007/s10584-018-2332-x
- Smith, N., and Leiserowitz, A. (2014). The role of emotion in global warming policy support and opposition. *Risk Anal.* 34, 937–948. doi: 10.1111/risa.12140
- Snijders, T., and Bosker, R. (2012). *Multilevel Analysis: An Introduction to Basic and Advanced Multilevel Modeling*. Thousand Oaks, CA: Sage.
- Song, H., Lewis, N. A., Ballew, M. T., Bravo, M., Davydova, J., Gao, H. O., et al. (2020). What counts as an "environmental" issue? Differences in issue conceptualization by race, ethnicity, and socioeconomic status. *J. Environ. Psychol.* 68:101404. doi: 10.1016/j.jenvp.2020.101404
- Spence, A., Poortinga, W., and Pidgeon, N. (2012). The psychological distance of climate change. *Risk Anal.* 32, 957–972. doi: 10.1111/j.1539-6924.2011.01695.x
- Steenjtes, K., Pidgeon, N. F., Poortinga, W., Corner, A. J., Arnold, A., Böhm, G., et al. (2017). *European Perceptions of Climate Change (EPCC): Topline Findings of a Survey Conducted in Four European countries in 2016*. Cardiff: Cardiff University.
- Steg, L., and Sievers, I. (2000). Cultural Theory and Individual Perceptions of Environmental Risks. *Environ. Behav.* 32, 250–269. doi: 10.1177/00139160021972513
- Swami, V., Chamorro-Premuzic, T., Snelgar, R., and Furnham, A. (2010). Egoistic, altruistic, and biospheric environmental concerns: a path analytic investigation of their determinants. *Scand. J. Psychol.* 51, 139–145. doi: 10.1111/j.1467-9450.2009.00760.x
- Tobler C., Visschers, V. H. M., and Siegrist, M. (2012). Consumers' knowledge about climate change. *Clim. Change* 114, 189–209. doi: 10.1007/s10584-011-0393-1
- Van der Linden, S. (2017). "Determinants and measurement of climate change risk perception, worry, and concern," in *The Oxford Encyclopedia of Climate Change Communication*, eds M. S. M. C. Nisbet, E. Markowitz, S. Ho, S. O'Neill, and J. Thaker, (Oxford: Oxford University Press).
- Van der Linden, S., Leiserowitz, A., and Maibach, E. (2019). The gateway belief model: a large-scale replication. *J. Environ. Psychol.* 62, 49–58. doi: 10.1016/j.jenvp.2019.01.009
- Van der Linden, S. L., Leiserowitz, A. A., Feinberg, G. D., and Maibach, E. W. (2015). The scientific consensus on climate change as a gateway belief: experimental evidence. *PLoS One* 10:e0118489. doi: 10.1371/journal.pone.0118489

Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Copyright © 2020 Gregersen, Doran, Böhm, Tvinnerim and Poortinga. This is an open-access article distributed under the terms of the Creative Commons Attribution License (CC BY). The use, distribution or reproduction in other forums is permitted, provided the original author(s) and the copyright owner(s) are credited and that the original publication in this journal is cited, in accordance with accepted academic practice. No use, distribution or reproduction is permitted which does not comply with these terms.

RESEARCH ARTICLE

Outcome expectancies moderate the association between worry about climate change and personal energy-saving behaviors

Thea Gregersen^{1,2*}, Rouven Doran¹, Gisela Böhm^{1,3}, Wouter Poortinga^{4,5}

1 Department of Psychosocial Science, University of Bergen, Bergen, Norway, **2** Centre for Climate and Energy Transformation (CET), University of Bergen, Bergen, Norway, **3** Department of Psychology, Inland Norway University of Applied Sciences, Lillehammer, Norway, **4** Welsh School of Architecture, Cardiff University, Cardiff, Wales, United Kingdom, **5** School of Psychology, Cardiff University, Cardiff, Wales, United Kingdom

* Thea.Gregersen@uib.no

Abstract

This paper explores whether efficacy beliefs can alter the relationship between worry about climate change and personal energy-saving behaviors, controlling for climate change beliefs and socio-demographics. For this purpose, we used data from 23 countries that participated in the European Social Survey Round 8 (N = 44 387). Worry about climate change, personal efficacy, personal outcome expectancy, and collective outcome expectancy were each associated with personal energy-saving behaviors concerning either energy curtailment or energy efficiency. The results further show that outcome expectancies moderate the association between worry about climate change and both types of energy behaviors. Worry was more strongly related to energy curtailment behaviors among those with high levels of personal and collective outcome expectancy. A similar pattern was found for energy efficiency behaviors, which were more strongly predicted by worry about climate change when combined with high levels of collective outcome expectancy. These findings are relevant for climate change communication, especially informational campaigns aiming to lower overall household energy use.

OPEN ACCESS

Citation: Gregersen T, Doran R, Böhm G, Poortinga W (2021) Outcome expectancies moderate the association between worry about climate change and personal energy-saving behaviors. *PLoS ONE* 16(5): e0252105. <https://doi.org/10.1371/journal.pone.0252105>

Editor: Arkadiusz Piwowar, Wroclaw University of Economics and Business, POLAND

Received: January 28, 2021

Accepted: May 9, 2021

Published: May 26, 2021

Copyright: © 2021 Gregersen et al. This is an open access article distributed under the terms of the [Creative Commons Attribution License](https://creativecommons.org/licenses/by/4.0/), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Data Availability Statement: Publicly available datasets were analyzed in this study. The data can be found here: <https://www.europeansocialsurvey.org/data/download.html?r=8>.

Funding: The author(s) received no specific funding for this work.

Competing interests: The authors have declared that no competing interests exist.

Introduction

In December 2019, the European Commission proposed the European Green Deal as part of a long-term strategy to move towards a circular economy, and eventually reach the goal of net-zero greenhouse gas (GHG) emissions no later than 2050 [1]. Actions outlined to reduce emissions include decarbonizing the energy sector by focusing on low-carbon energy sources and efficient energy use. When it comes to measures that individual households can implement to save energy, the pertinent literature commonly distinguishes between curtailment and efficiency [2, 3]. Energy curtailment refers to actions that save energy by reducing the frequency or intensity of certain behaviors, such as turning off the lights when leaving a room. Energy efficiency-related actions, in contrast, refer to investments in energy-efficient equipment

which do not necessarily require behavioral change, such as replacing an old cooling unit in the household. This conceptual distinction has been empirically supported for several household behaviors, including personal attempts to save water [4] and energy [5].

According to statistics provided by the International Energy Agency (IEA), the residential sector accounts for a considerable share of the overall energy consumption in Europe, a pattern that appears relatively stable over time [6]. It follows from this that promoting energy savings at the household level has the potential to significantly reduce GHG emissions and, in turn, help reach the goal of net-zero emissions. Knowledge about individual-level factors that may foster curtailment and/or efficiency behaviors can provide useful insights for targeted communication strategies; and numerous studies have focused on the psychological determinants of such behaviors, both within [e.g., 7–9] and outside [e.g., 10–13] the European context. The investigation reported in this paper is premised on the assumption that people's motivation to protect themselves against perceived threats, and by extension how they will eventually react to the threatening situation, can be derived from an appraisal of the threat itself and an appraisal of their coping capacity [14, 15]. An increasing volume of empirical studies suggests that the outcomes of these appraisals are not only relevant for explaining coping with individual stressors such as health problems [16, 17], but also for predicting how individuals respond in the face of environmental stressors [18–20].

Threat appraisals—often operationalized as 'worry', 'concern', or 'perceived seriousness'—have received considerable research attention with regards to the study of people's perceptions of climate change [21]. Research focusing specifically on the issue of climate change and self-reported energy-saving behaviors has documented that people who are concerned about climate change report a higher willingness to reduce their energy use [22]. Pertinent literature generally finds a positive relationship between the perceived seriousness of climate change and both curtailment- and efficiency-related actions [23], for example showing that people who rank 'climate change' as the most serious issue facing the world are more likely to engage in household energy-saving behaviors, such as buying energy-efficient household appliances [24]. Worry, characterized by the repeated experience of anxiousness or thoughts about a potentially negative event, is considered more personal and experiential than perceived seriousness and concern and thus more likely to motivate mitigative actions [21, 25].

In line with this, recent literature has identified worry about climate change as one individual-level factor that may motivate energy-saving behaviors. Umit, Poortinga, Jokinen and Pohjolainen [26] analyzed data from Round 8 of the European Social Survey (ESS) to explore the role of income on such behaviors while controlling for worry about climate change, among other variables. They reported that those more worried about climate change scored higher on both curtailment-related (i.e., reducing the amount of energy consumed) and efficiency-related (i.e., making financial investments in energy-efficient appliances) actions. Bouman et al. [25] used the same dataset to consider worry as a predictor of energy-saving behaviors and climate policy support. The more individuals expressed worry about climate change, the more likely they were to report engaging in energy-saving behaviors; yet, the direct relationship between the variables was relatively weak [25]. These findings imply that worry about climate change is arguably relevant, but maybe not sufficient, for people to engage in personal energy-saving behaviors. As stated by Steg [27], "people often do not act in line with their concerns, and total household energy use is still rising" (p. 4450). The current paper expands upon the existing literature by exploring whether various forms of efficacy beliefs can explain parts of this gap.

A central aspect of understanding why people engage in or refrain from acting against climate change is their sense of efficacy [28, 29]. The notion of efficacy was originally introduced by Bandura [30], who distinguished between beliefs about one's ability to perform a specific

behavior (personal efficacy) and expectations about whether this behavior will lead to certain outcomes (outcome expectancy). This distinction has been widely used in the psychological literature, for instance in the assumption that perceived efficacy and outcome expectancy may both feed into coping appraisals in the face of health threats [31] and environmental problems [20]. With particular relevance for the present investigation are studies showing that higher levels of personal efficacy are associated with attempts to conserve energy by specifically regulating temperature or generally performing household curtailment behaviors [32] and with a range of other individual pro-environmental [33–35] and adaptation [36] behaviors. Positive relationships between efficacy beliefs and different forms of pro-environmental behaviors have also been reported in empirical investigations with measures combining personal efficacy and outcome expectancy [e.g., 37–40].

Recognizing that any successful mitigative response to climate change necessitates cooperation from across society, there have been calls to investigate efficacy beliefs relating to collective action in addition to, and sometimes instead of, personal efficacy [41, 42]. Studies within this area indicate that believing in a group's collective ability to achieve desired outcomes relates to public support for policies aimed at reducing carbon emissions [43], public-sphere actions such as voting and protesting [44], household waste management [45], electric vehicle acceptance [46], and intention to reduce plastic use [47]. Some findings indicate that collective efficacy might be more important than personal efficacy in the context of pro-environmental behaviors more generally [18, 19], even though this finding is not always consistent [48, 49].

While there are reasons to assume that being worried will function as a motivation for people to act on climate change [21, 50, 51], believing that one's actions are insignificant may in the meantime restrain personal engagement, even among those who are aware of the threat climate change poses [52, 53]. Research on fear appeals suggests that perceived risk without a sense of efficacy can lead to denial or disclaiming responsibility rather than taking action [54–56]. Whereas the notion that high levels of perceived risk can hinder action when combined with low levels of efficacy is not always supported [51, 57], it is generally assumed that high levels of efficacy reduce doubts or avoidance in situations where people express a general willingness to act [58–60]. Supporting evidence stems from research showing that informational messages combining high threat with high efficacy are more effective in increasing personal engagement with climate change than messages portraying only the possible negative impacts [61]. One plausible interpretation of this literature is that even though a certain level of concern (or worry) for climate change may facilitate preparedness to take mitigative actions, believing that the proposed strategies are effective and that one has the capacity to implement them, helps enable actual behavioral responses.

Research aims

Our research draws on cross-national studies supporting a positive relationship between worry about climate change and personal energy-saving behaviors [25, 26]. Building upon these findings, the goal of the current paper is twofold: (i) to establish the relative importance of worry about climate change for explaining self-reported energy curtailment and energy efficiency behaviors, controlling for efficacy beliefs, climate change beliefs, and socio-demographics; (ii) to test whether the relationship between worry about climate change and personal energy-saving behaviors varies as a function of believing that one can perform the behavior (personal efficacy), that it is likely that a large number of people will perform the behavior (collective efficacy), and that this would mitigate climate change either through individual action (personal outcome expectancy) and/or through group action (collective outcome expectancy). We expect that worry will be more strongly related to energy efficiency and curtailment

behaviors when combined with the belief that personal and collective behavior change is possible and/or effective for mitigating climate change. Because people living within the same country are likely to share certain characteristics and are thus expected to be somewhat similar in their responses, multilevel models are used to control for possible group effects in energy curtailment and energy efficiency [62].

Materials and methods

Data collection

The findings reported in this paper are based on self-report data obtained from $N = 44\,387$ respondents from 23 mostly European countries. The data were collected through face-to-face interviews in 2016–2017 as part of the ESS Round 8 [63], which was the first round to include questions on climate change and energy behaviors. Strict random probability sampling was used to draw samples from each country, with participants aged 15 and over. The total sample consists of 48% males and 52% females with a combined mean age of 46.97 years ($SD = 18.85$) when adjusted for post-stratification and population size weights. The study was reviewed and approved by ESS ERIC Research Ethics Committee (REC). In accordance with the ESS ERIC Statutes (Article 23.3), the ESS ERIC subscribes to the Declaration on Professional Ethics of the International Statistical Institute. Written informed consent to participate in the study was given by all participants and was provided by the participant's legal guardian/next of kin if the respondent was under 16 years of age at the time of the interview. More detailed information about the data is available in the documentation report [64].

Measurements

Two types of energy behaviors were included as dependent variables in the analyses, energy curtailment behaviors, and energy efficiency behaviors [2, 3]. Energy curtailment behaviors were measured by asking “There are some things that can be done to reduce energy use, such as switching off appliances that are not being used, walking for short journeys, or only using the heating or air conditioning when really needed. In your daily life, how often do you do things to reduce your energy use?”, with response categories 1 (*Never*), 2 (*Hardly ever*), 3 (*Sometimes*), 4 (*Often*), 5 (*Very often*), and 6 (*Always*). Energy efficiency behaviors were assessed with the question “If you were to buy a large electrical appliance for your home, how likely is it that you would buy one of the most energy efficient ones?”, measured on a scale from 0 (*Not likely at all*) to 10 (*Extremely likely*). There were $n = 551$ (for curtailment) and $n = 1\,111$ (for efficiency) missing values.

The independent variables consisted of worry about climate change and four efficacy beliefs. Worry about climate change was measured by asking respondents to answer the question “How worried are you about climate change?” from 1 (*Not at all worried*), 2 (*Not very worried*), 3 (*Somewhat worried*), 4 (*Very worried*) to 5 (*Extremely worried*). The item had $n = 1\,733$ missing values.

The four efficacy beliefs referred to (a) personal efficacy, (b) personal outcome expectancy, (c) collective efficacy, and (d) collective outcome expectancy. Personal efficacy was measured with the question “Overall, how confident are you that you could use less energy than you do now?” with a response scale ranging from 0 (*Not at all confident*) to 10 (*Completely confident*) and $n = 952$ missing observations. The question “How likely do you think it is that limiting your own energy use would help reduce climate change?” was used as an indicator of personal outcome expectancy. Collective efficacy was assessed with the question “How likely do you think it is that large numbers of people will actually limit their energy use to try to reduce climate change?”. Finally, the following question captured the level of collective outcome

expectancy: “Now imagine that large numbers of people limited their energy use. How likely do you think it is that this would reduce climate change?”. The last three questions were answered on a scale from 0 (*Not at all likely*) to 10 (*Extremely likely*), with $n = 2\,733$ (for personal outcome expectancy), $n = 2\,977$ (for collective efficacy), and $n = 3\,255$ (for collective outcome expectancy) missing values.

Covariates in the analyses included climate change beliefs and a number of socio-demographic variables. Climate change beliefs, previously shown to be related to worry about climate change in the ESS [65], were captured with two questions. The question “Do you think that climate change is caused by natural processes, human activity, or both?”, with answer categories 1 (*Entirely by natural processes*), 2 (*Mainly by natural processes*), 3 (*About equally by natural processes and human activity*), 4 (*Mainly by human activity*), or 5 (*Entirely by human activity*), was asked to assess respondents’ beliefs about the anthropogenic causation of climate change. There was a total of $n = 2\,502$ missing values to this question, including the response option labeled “I don’t think the climate is changing”. Evaluation of the seriousness of climate change consequences was assessed with the question “How good or bad do you think the impact of climate change will be on people across the world?”. The question was originally answered on an 11-point scale ranging from 0 (*Extremely bad*) to 10 (*Extremely good*), which was later reversed and dichotomized to 0 (*Belief that the impacts will be good or neutral*), including answers from 5 to 10, and 1 (*Belief in mostly bad impacts*), including answers from 0 to 4. The variable was dichotomized in order to distinguish those who believe in mostly negative impacts of climate change from those who do not, following similar procedures as in Gregeren et al. [65].

Household income was categorized from the 1st to 10th decile. It should be noted that this variable had quite a lot of missing observations ($n = 7\,942$). Of these, $n = 4\,990$ missing observations were due to refusal to answer the question, while the rest comprised “don’t know” ($n = 2\,902$) and missing data without an assigned explanation ($n = 50$). Political orientation was assessed by asking respondents “In politics people sometimes talk of ‘left’ and ‘right’. Using this card, where would you place yourself on this scale, where 0 means the left and 10 means the right?”. The variable had 5 804 missing observations. Age was categorized into ten-year intervals and gender was dichotomized into male (0) and female (1). Education was measured based on the ESS version of the ISCED (International Standard Classification of Education) categorization: 1 (*ES-ISCED I/less than lower secondary*), 2 (*ES-ISCED II/lower secondary*), 3 (*ES-ISCED IIIb/lower-tier upper secondary*), 4 (*ES-ISCED IIIa/upper-tier upper secondary*), 5 (*ES-ISCED IV/advanced vocational/sub-degree*), 6 (*ES-ISCED VI/lower tertiary education/BA level*), 7 (*ES-ISCED V2/higher tertiary education/> = MA level*).

Further descriptive information can be found in [Table 1](#). Correlations between the main variables are reported in [Table 2](#).

Statistical analysis

Due to the nested structure of the ESS Round 8 data, the associations between worry about climate change and personal energy-saving behaviors were analyzed by fitting linear two-level (individual and country) multilevel models in Stata 16 using the `mixed` command. As we were interested in the overall effect of the variables and in generalizing the results to a broader population, the role of the country-level residuals was to help estimate standard errors correctly. We conducted multiple regressions to allow us to measure the effect of each predictor while controlling for the other relevant variables.

We started by fitting an unconditional null model, followed by a random-intercept model including all predictors (Model 1), and lastly adding the four interaction terms (Model 2). This

Table 1. Descriptive statistics for the variables in the study.

Individual level (N = 44 387)	M	SD	Min	Max
Energy curtailment behavior (1 = Never; 6 = Always)	4.09	1.28	1	6
Energy efficiency behavior (0 = Not at all likely; 10 = Extremely likely)	7.53	2.43	0	10
Worry about climate change (1 = Not at all worried; 5 = Extremely worried)	3.06	0.94	1	5
Personal efficacy (0 = Not at all confident; 10 = Completely confident)	5.87	2.62	0	10
Personal outcome expectancy (0 = Not at all likely; 10 = Extremely likely)	4.35	2.58	0	10
Collective efficacy (0 = Not at all likely; 10 = Extremely likely)	4.05	2.15	0	10
Collective outcome expectancy (0 = Not at all likely; 10 = Extremely likely)	5.51	2.34	0	10
Household income (1 = 1st decile; 10 = 10th decile)	5.36	2.76	1	10
Climate change attribution (1 = Entirely natural processes; 5 = Entirely human activity)	3.42	0.83	1	5
Climate change impact (0 = Extremely good; 10 = Extremely bad)	6.80	2.19	0	10
Age	46.97	18.85	15	100
Gender (Female)	0.52	0.50	0	1
Education	3.78	1.82	1	7

Note. All variables are weighted with a combination of post-stratification weights and population weights. The variables are presented in their original scales, except that climate change impact has been reversed.

<https://doi.org/10.1371/journal.pone.0252105.t001>

procedure was conducted separately for energy curtailment and energy efficiency behaviors, as these were predicted in separate models. All models were estimated with maximum likelihood and compared with likelihood ratio tests. The `margins` and `marginsplot` commands were used to interpret the interaction effects. Except for gender and beliefs about climate change consequences, which were both dichotomized, all other variables were treated as continuous and grand-mean centered in the main models. Standardized versions of the variables were used in complementary models to allow us to compare the distinct influence each predictor had on the outcomes. Standardization can influence the interpretation of variance [62], and was therefore avoided in the models presented in the multilevel regression tables. Proportional reduction in variance (PRV), calculated by comparing the explained variance of the main effects models with and without the worry item, was used as a second indication of the effect size of worry about climate change. Results from the standardized models and PRV calculations are presented below. Finally, *Pseudo R*² was used to indicate the variance explained by all variables combined, following recommendations by Rabe-Hesketh and Skrondal [66]. *Pseudo R*² was calculated by comparing the total residual variance of the null model to the residual variance of the fitted models.

Results

Fig 1 shows the country-specific means for energy curtailment behaviors, and Fig 2 the country-specific means for energy efficiency behaviors, including standard deviations. In total, 68% of respondents answered that they often, very often, or always do things to reduce their energy use. Furthermore, about 80% answered above the midpoint of the 11-point scale when asked how likely they are to buy energy-efficient appliances, with 27% answering at the endpoint (“extremely likely”). The weighted correlation between the two outcomes is $r = .36$, which is usually considered a moderate effect [67].

Intraclass correlation (ICC), calculated as $\sigma^2_{\text{country}} / (\sigma^2_{\text{country}} + \sigma^2_{\text{individual}})$, was used to explore the homogeneity within countries regarding energy behaviors [62, 68]. In the unconditional model, the country level explained about 3%, ICC = 0.03, 95% CI [0.02, 0.06], of the variation in energy curtailment behaviors and 6%, ICC = 0.06, 95% CI [0.03, 0.10], of the variation

Table 2. Correlation matrix for the main predictors in the study (weighted).

	Energy curtailment behavior	Energy efficiency behavior	Worry about climate change	Personal efficacy	Personal outcome expectancy	Collective efficacy	Collective outcome expectancy	Climate change attribution	Climate change impact	Political orientation	Age	Gender (Female)	Household Income	Education
Energy curtailment behavior	1.00													
Energy efficiency behavior	0.36**	1.00												
Worry about climate change	0.23**	0.21**	1.00											
Personal efficacy	0.21**	0.22**	0.17**	1.00										
Personal outcome expectancy	0.14**	0.14**	0.24**	0.27**	1.00									
Collective efficacy	0.07**	0.05**	0.11**	0.17**	0.44**	1.00								
Collective outcome expectancy	0.15**	0.15**	0.28**	0.27**	0.45**	0.35**	1.00							
Climate change attribution	0.06**	0.08**	0.30**	0.09**	0.11**	0.03**	0.21**	1.00						
Climate change impact	0.09**	0.11**	0.29**	0.04**	-0.04**	-0.16**	0.07**	0.24**	1.00					
Political orientation	-0.06**	-0.02**	-0.11**	-0.01	-0.01	0.04**	-0.04**	-0.10**	-0.12**	1.00				
Age	0.18**	0.12**	-0.01*	-0.06**	-0.02**	0.05**	-0.04**	-0.07**	-0.04**	0.04**	1.00			
Gender (Female)	0.04**	0.00	0.05**	-0.04**	0.01**	0.03**	0.04**	-0.01**	-0.02**	0.06**	0.06**	1.00		
Household income	-0.04**	0.09**	0.03**	0.10**	0.01*	-0.05**	0.02**	0.06**	0.04**	0.01**	-0.20**	-0.10**	1.00	
Education	0.01	0.06**	0.06**	0.06**	0.00	-0.04**	0.02**	0.04**	0.07**	-0.04**	-0.17**	0.01	0.38**	1.00

Note. Pairwise correlation coefficients. Weighted with a combination of post-stratification weights and population weights. All variables are used in their original scales, except that climate change impact has been reversed.

* $p < .05$ (two-tailed)

** $p < .01$ (two-tailed)

*** $p < .001$ (two-tailed).

<https://doi.org/10.1371/journal.pone.0252105.t002>

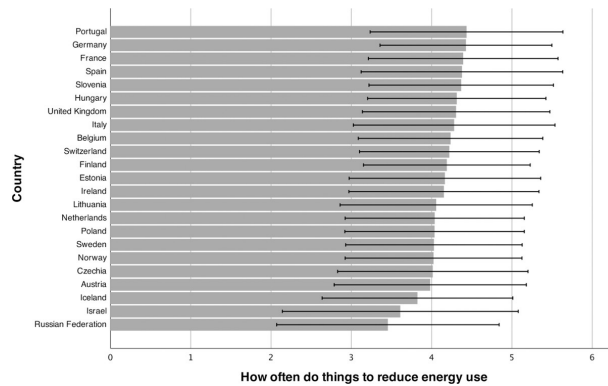


Fig 1. Mean energy curtailment behavior. Note. Means weighted with a combination of post-stratification weights and population weights. The figure includes +/- 1 SD.

<https://doi.org/10.1371/journal.pone.0252105.g001>

in energy efficiency behaviors. Even though the variance explained at the country level was sparse, we decided on multi-level models rather than single-level models to reduce the likelihood of Type I error. This follows the idea that clustering should be accounted for independently of ICC levels [69].

Tables 3 and 4 present the unstandardized coefficients of the main effects (Model 1) for curtailment and efficiency behaviors, respectively. Results from standardized versions of the model show that worry was one of the strongest predictors, $\beta = .19$ ($p < .001$), of energy curtailment behaviors, together with age, $\beta = .18$ ($p < .001$). Also, personal efficacy, $\beta = .05$ ($p < .001$); personal outcome expectancy, $\beta = .04$ ($p < .001$); and collective outcome expectancy, $\beta = .05$ ($p < .001$); were each positively associated with self-reported curtailment behaviors. Energy curtailment was further associated with higher levels of education, $\beta = .08$ ($p < .001$); lower household income, $\beta = -.06$ ($p < .001$); a self-identified left-leaning political orientation, $\beta = -.04$ ($p < .001$); and with less belief in anthropogenic causes of climate change, $\beta = -.02$ ($p = .006$). Women reported a higher frequency of curtailment than men, $\beta = .04$ ($p < .001$).

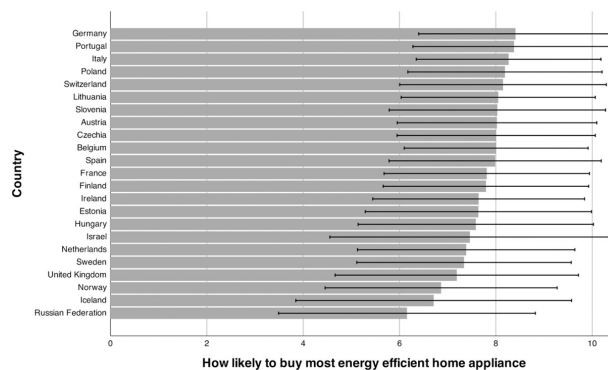


Fig 2. Mean energy efficiency behavior. Note. Means weighted with a combination of post-stratification weights and population weights. The figure includes +/- 1 SD.

<https://doi.org/10.1371/journal.pone.0252105.g002>

Table 3. Model results—Energy curtailment behavior.

	Null Model	Model 1 (Main effects)	Model 2 (Interactions)
	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)
Fixed coefficients			
Intercept	4.19 (0.04)	4.11 (0.04)	4.01 (0.04)
Worry about climate change		0.21 (0.01)***	0.21 (0.01)***
Personal efficacy (PE)		0.02 (0.00)***	0.02 (0.00)***
Personal outcome expectancy (POE)		0.01 (0.00)***	0.01 (0.00)***
Collective efficacy (CE)		-0.00 (0.00)	-0.00 (0.00)
Collective outcome expectancy (COE)		0.02 (0.00)***	0.02 (0.00)***
Worry about climate change × PE			-0.00 (0.00)
Worry about climate change × POE			0.01 (0.00)*
Worry about climate change × CE			0.00 (0.00)
Worry about climate change × COE			0.01 (0.00)**
Climate change attribution		-0.03 (0.01)**	-0.02 (0.01)*
Climate change impact (Bad)		0.02 (0.02)	0.02 (0.02)
Political orientation		-0.02 (0.00)***	-0.02 (0.00)***
Age		0.01 (0.00)***	0.01 (0.00)***
Gender (Female)		0.07 (0.01)***	0.07 (0.01)***
Household income		-0.02 (0.00)***	-0.02 (0.00)***
Education		0.05 (0.00)***	0.04 (0.00)***
Random parameters			
Level 2: Country(var)	0.05 (0.01)	0.03 (0.01)	0.03 (0.01)
Level 1: Individual(var)	1.30 (0.01)	1.22 (0.01)	1.21 (0.01)
Log likelihood	-45770.793	-44766.145	-44748.805
AIC	91547.59	89562.29	89535.61
Variance explained	ICC = 0.03, 95% CI [0.02,0.06]	<i>Pseudo R</i> ² = 0.07 <i>R</i> ₂ ² = 0.03 <i>R</i> ₁ ² = 0.06	<i>Pseudo R</i> ² = 0.07 <i>R</i> ₂ ² = 0.03 <i>R</i> ₁ ² = 0.06

Note. Total R-squared and separate reduction in variance are calculated following the method used in Rabe-Hesketh and Skrondal [66]. $N = 29\,492$ individuals, $N = 23$ countries. All variables are grand-mean centered, except gender (0 = Male; 1 = Female) and climate change impact (0 = Good; 1 = Bad). Unweighted.

* $p < .05$

** $p < .01$

*** $p < .001$.

<https://doi.org/10.1371/journal.pone.0252105.t003>

Including all covariates led to an improvement in model fit compared to the unconditional model, $\chi^2(12) = 2009.30$, $p < .001$, and about 7% of the residual variance in energy curtailment behaviors was explained (*Pseudo R*² = 0.07). Worry about climate change accounts for about 3% (PRV = 0.03) of this variance.

Regarding purchases of energy-efficient appliances, the strongest association was with age, $\beta = .37$ ($p < .001$); followed by worry, $\beta = .28$ ($p < .001$). Personal efficacy, $\beta = .20$ ($p < .001$); personal outcome expectancy, $\beta = .08$ ($p < .001$); and collective outcome expectancy, $\beta = .13$ ($p < .001$), each predicted a higher likelihood of purchasing energy-efficient appliances. Respondents with higher levels of education also reported a higher likelihood of buying efficient appliances, $\beta = .15$ ($p < .001$), as did women, $\beta = .08$ ($p < .001$), those with higher

Table 4. Model results—Energy efficiency behavior.

	Null Model	Model 1 (Main effects)	Model 2 (Interactions)
	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)	<i>B</i> (<i>SE</i>)
Fixed coefficients			
Intercept	7.83 (0.11)	7.64 (0.11)	7.64 (0.11)
Worry about climate change		0.30 (0.02)***	0.30 (0.02)***
Personal efficacy (PE)		0.08 (0.01)***	0.08 (0.01)***
Personal outcome expectancy (POE)		0.03 (0.01)***	0.03 (0.01)***
Collective efficacy (CE)		-0.01 (0.01)	-0.01 (0.01)
Collective outcome expectancy (COE)		0.05 (0.01)***	0.05 (0.01)***
Worry about climate change × PE			-0.01 (0.00)
Worry about climate change × POE			-0.00 (0.01)
Worry about climate change × CE			-0.01 (0.01)
Worry about climate change × COE			0.01 (0.01)*
Climate change attribution		-0.00 (0.02)	-0.00 (0.02)
Climate change impact (Bad)		0.06 (0.03)*	0.06 (0.03)*
Political orientation		-0.00 (0.01)	-0.00 (0.01)
Age		0.02 (0.00)***	0.02 (0.00)***
Gender (Female)		0.16 (0.02)***	0.16 (0.02)***
Household income		0.04 (0.00)***	0.04 (0.00)***
Education		0.08 (0.01)***	0.08 (0.01)***
Random parameters			
Level 2: Country	0.27 (0.08)	0.26 (0.08)	0.26 (0.08)
Level 1: Individual	4.52 (0.04)	4.20 (0.03)	4.20 (0.03)
Log likelihood	-64053.153	-62969.588	-62965.489
AIC	128112.3	125969.2	125969
Variance explained	ICC = 0.06, 95% CI [0.03,0.10]	<i>Pseudo R</i> ² = 0.07 <i>R</i> ₂ ² = 0.04 <i>R</i> ₁ ² = 0.07	<i>Pseudo R</i> ² = 0.07 <i>R</i> ₂ ² = 0.04 <i>R</i> ₁ ² = 0.07

Note. Total R-squared and separate reduction in variance are calculated following the method used in Rabe-Hesketh and Skrondal [66]. *N* = 29 448 individuals, *N* = 23 countries. All variables are grand-mean centered, except gender (0 = Male; 1 = Female) and climate change impact (0 = Good; 1 = Bad). Unweighted.

**p* < .05

***p* < .01

****p* < .001.

<https://doi.org/10.1371/journal.pone.0252105.t004>

household income, $\beta = .11$ ($p < .001$), and those believing in negative impacts of climate change, $\beta = .03$ ($p = .039$). According to the PRV calculation, worry about climate change explained less than 2% of the variance in energy efficiency behaviors ($PRV = 0.02$). The model explained approximately 7% of the residual variance ($Pseudo R^2 = 0.07$) and was an improvement compared to the unconditional model, $\chi^2(12) = 2167.13$, $p < .001$.

Four interactions between worry and efficacy beliefs were added in Model 2, which is presented in Table 3 for curtailment and in Table 4 for efficiency behaviors. For the model including energy curtailment behavior as the dependent variable, there were two statistically significant interactions (see Table 3). The simple slopes for worry were statistically significant at both low, $B = .18$ (.02), $z = 11.53$, $p < .001$, 95% CI [0.15, 0.21], and high, $B = .25$ (.02),

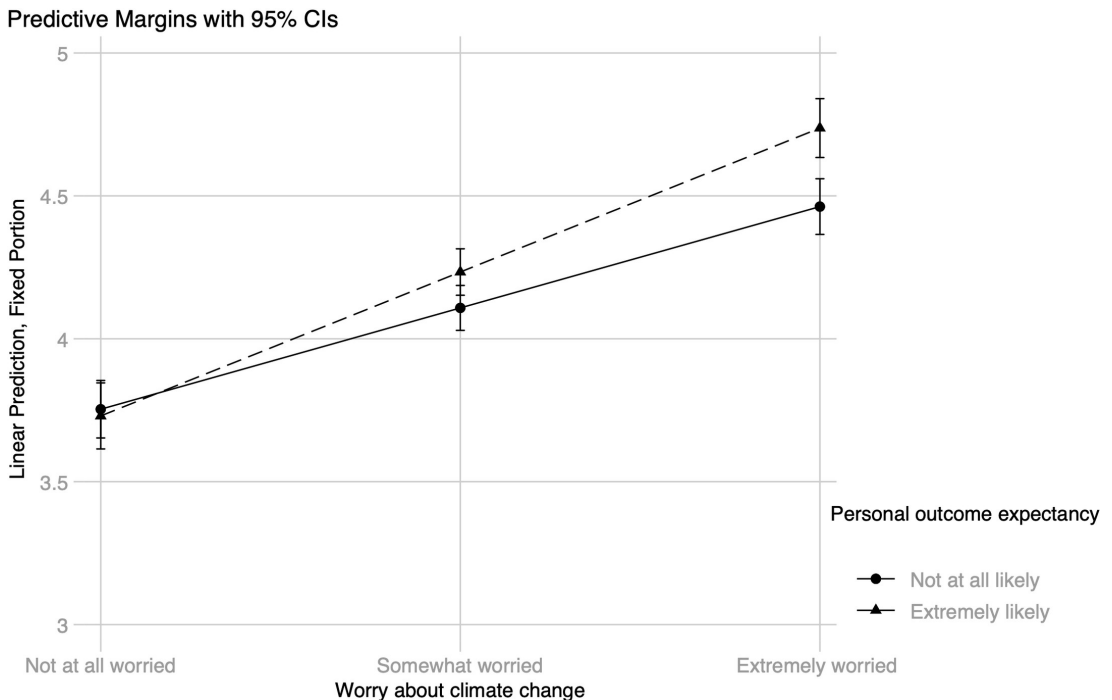


Fig 3. Energy curtailment behavior: Worry about climate change \times personal outcome expectancy.

<https://doi.org/10.1371/journal.pone.0252105.g003>

$z = 13.48, p < .001, 95\% \text{ CI } [0.22, 0.29]$, levels of personal outcome expectancy; the same pattern was found at low, $B = .15 (.02), z = 7.74, p < .001, 95\% \text{ CI } [0.11, 0.19]$, and high, $B = .25 (.02), z = 15.69, p < .001, 95\% \text{ CI } [0.22, 0.28]$, levels of collective outcome expectancy. However, an inspection of the interaction plots shows that worry about climate change had a stronger association with curtailment for those with high levels of personal outcome expectancy (see Fig 3) as well as those with high levels of collective outcome expectancy (see Fig 4). The difference between people with high versus low levels of personal outcome expectancy seems to occur only at high levels of worry, while the difference between high versus low levels of collective outcome expectancy is present at both moderate and high levels of worry. The reported level of outcome expectancy, whether personal or collective, does not seem to make a difference among individuals who are not at all worried about climate change. Including the interactions significantly improved the model with curtailment behavior as the criterion, $\chi^2(4) = 34.68, p < .001$.

For the model with energy efficiency behaviors as the dependent variable, only one interaction was statistically significant (see Table 4). The simple slopes show a positive relationship between worry and efficiency behavior at both low, $B = .22 (.04), z = 6.08, p < .001, 95\% \text{ CI } [0.15, 0.30]$, and high, $B = .36 (.03), z = 11.86, p < .001, 95\% \text{ CI } [0.30, 0.42]$, levels of collective outcome efficacy. Still, the plot displayed in Fig 5 indicates that the relationship is stronger for those who score high on collective outcome expectancy at both moderate and high levels of worry about climate change. Again, there is no difference between those with high versus low

Predictive Margins with 95% CIs

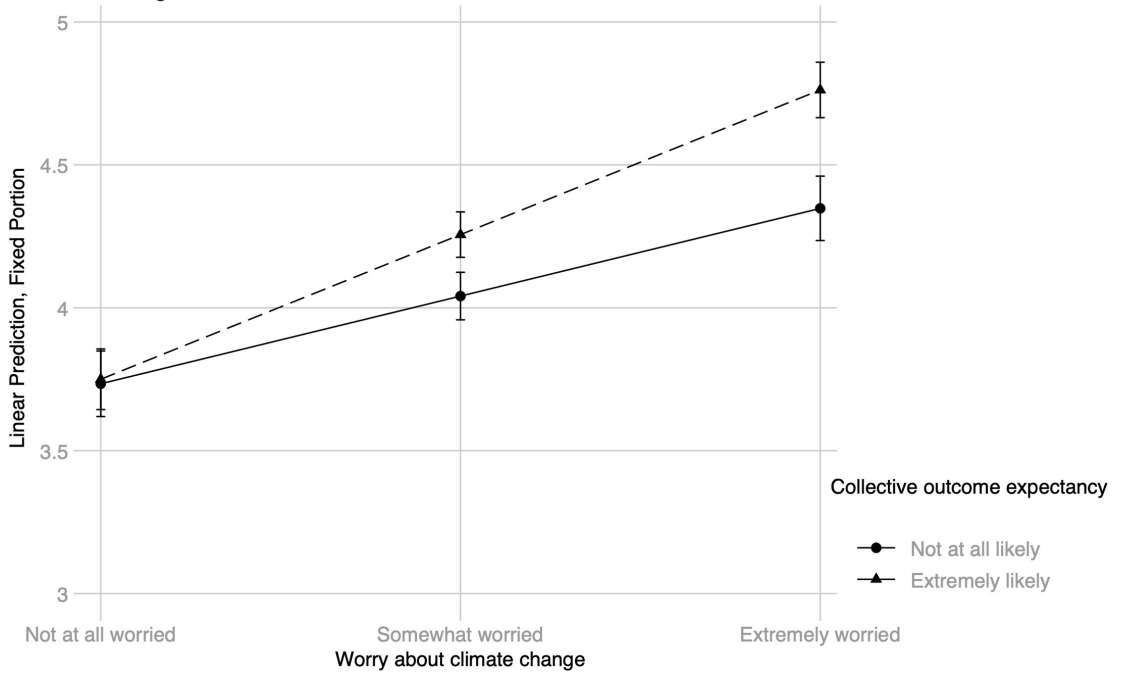


Fig 4. Energy curtailment behavior: Worry about climate change × collective outcome expectancy.

<https://doi.org/10.1371/journal.pone.0252105.g004>

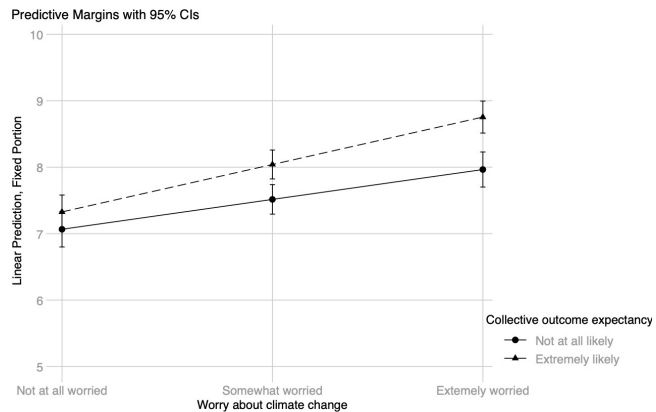


Fig 5. Energy efficiency behavior: Worry about climate change × collective outcome expectancy.

<https://doi.org/10.1371/journal.pone.0252105.g005>

levels of collective outcome expectancy among individuals who are not at all worried about climate change. Including the interactions did not statistically significantly improve the model fit, $\chi^2(4) = 8.20$, $p = .085$.

All main coefficients stay highly similar from Model 1 to Model 2; and the variables continue to explain about 7% of the variance in each of the two types of personal energy-saving behaviors (*Pseudo* $R^2 = 0.07$). Additionally, the estimated intraclass correlations do not change substantially from the unconditional model to the final model and indicate that unobserved characteristics at the country level can explain about 3% of the variance in energy curtailment behaviors and about 6% of the variance in energy efficiency behaviors.

Discussion

Our results show that worry about climate change was an important predictor of individuals engaging in both energy curtailment and energy efficiency behaviors, compared to most of the other variables included in the study. They further show that both curtailment and efficiency behaviors were more likely to be reported when such behaviors were perceived to be possible (high personal efficacy) and effective in mitigating climate change when employed alone (personal outcome expectancy) or as a collective (collective outcome expectancy). This supports previous findings establishing that different efficacy constructs can be empirically distinguished in terms of their contribution to pro-environmental behaviors [e.g., 43, 44, 70]. The distinct effect size of each of the significant efficacy constructs was highly similar when predicting energy curtailment behaviors. In contrast, the effect sizes of the efficacy constructs differed with respect to purchasing energy-efficient appliances. Personal efficacy showed the strongest association, followed by collective outcome expectancy and finally personal outcome expectancy. Notably, personal efficacy had the weakest association with the other efficacy items (see Table 2). Collective efficacy, operationalized as believing that many people will limit their energy use to reduce climate change, failed to show any statistically significant associations in predicting energy saving behaviors. Other measurements of collective efficacy have also shown non-significant [44] or weak [43] effects in previous studies.

The present research was based on the idea that efficacy beliefs may interact with worry about climate change in shaping behavioral responses to environmental problems. Contrary to our expectations, only outcome expectancies showed any significant moderating effects in our models. Examples of reasons for low scores on the outcome expectancy measurements would be believing one's individual energy-saving efforts to be insignificant compared to the non-action of other individuals (low personal outcome expectancy) or that collective energy-saving is trivial in the face of emissions from big companies (low collective outcome expectancy). Our results support the assumption that worrying about climate change is more strongly related to energy curtailment behavior for those with high levels of personal and collective outcome expectancy, and that energy efficiency behavior is best predicted by a combination of high worry and high levels of collective outcome expectancy. A possible reason for finding collective outcome expectancy to be the most consistent moderator might be the global scale and inherently collective nature of climate change [41, 42]. Our research focuses on the global effects of energy-saving as seen by the public in European countries, which allows for the possibility that moderation effects in regards to the remaining efficacy measures can be found in other contexts. Previous research supports this view insofar that household energy behaviors can have somewhat different predictors across countries [25] and cities [10].

High worry appears to be positively associated with energy behaviors at both low and high levels of outcome expectancy. Though it should be noted that the general measurement of worry about climate change used in the current study differs from the immediate fear appeals

used in many experimental studies [e.g., 71], the finding support that high levels of perceived risk do not seem to have a negative effect (“backfire”) [51, 57]. High levels of outcome expectancy seem to have the potential to reinforce the effect of high worry, but not make a difference if people are not at all worried about climate change. The lack of effect of outcome expectancies at low levels of worry indicates that the motivational aspect of worrying about climate change is additionally necessary to create intent and desire to engage in personal energy-saving behaviors. Without the arousal introduced by feeling worried and the recognition of climate change as a risk, the notion that individual or collective energy-saving behaviors would help reduce climate change might not be seen as personally relevant. This is in line with seeing concern as a necessary pre-condition [60]. Based on our findings, one strategy for climate change communication might be to continue to inform people about the risks associated with continued global warming [72], while also focusing on the mitigative potential of individual and collective actions [73].

Limitations

When investigating complex human behavior, small effect sizes are expected. While acknowledging that small effects can still be highly relevant and important to the field [74], it should be noted that our models including all individual-level variables and interactions account for only about 7% of the variance in both energy-saving behaviors. According to this and our other effect size measures, the relationship between worry about climate change and energy-saving behaviors is rather weak. This is in line with prior literature pointing to a gap between an expressed concern about climate change and the individual willingness to act [75, 76].

There may be several reasons why we find relatively weak effects in the current study. First, our measurement of worry may not have captured the state we were interested in with perfect validity. One item asking the respondent ‘how worried’ he or she is about climate change might prime a short-term, passive agreement indicating awareness of the issue rather than the active, personal emotion we sought to capture. In future research, a better qualitative, methodological understanding of people’s responses to this question is necessary. For example, researchers could use cognitive interviewing to determine how people read and perceive this and similar items and what they associate with the term ‘being worried’ in a survey context. Second, the measurement of worry focuses on climate change in general rather than on the issue of energy consumption in particular. It could be that energy behaviors would be more strongly related to behavior-specific concerns rather than the more generalized climate change worry [for supporting evidence, see 11, 77]. Third, threat and coping appraisals do not appear to be sufficient for motivating individuals to engage in energy saving at the household level. Instead, the comparatively weak effects point to the importance of considering other factors not included in this study, such as norms, habits, and structural constraints [77, 78]. Finally, even when climate change is perceived to be a threat that requires action, energy behaviors may not be seen as particularly relevant or effective in this regard. If this is the case, one might expect the interaction effects between worry and outcome expectancy to be stronger. However, the questions used to measure personal and collective outcome expectancy ask only whether limiting energy use would help reduce climate change, not how big the impact would be. People might still perceive energy savings to have quite a limited effect compared to other actions. Increased information about the comparative effectiveness of energy curtailment and energy efficiency behaviors or about how they contribute to a sustainable lifestyle might be helpful if the goal is to change people’s perceptions of such behaviors.

The study has some additional limitations regarding the measurements used to capture energy behaviors. First, whether people who express willingness to engage in personal energy-

saving behaviors implement these behaviors in their everyday lives cannot be answered based on the present data. Previous research employing meta-analytic techniques has found only a moderate correlation between self-reported and objective measures of pro-environmental behavior, leaving 79% of the variance unexplained [79]. Second, the analyses relied upon single-item measures of energy curtailment and energy efficiency behaviors, both of which were formulated in rather broad terms. For example, the item assessing curtailment included an array of example behaviors spanning from switching off unused appliances and walking for shorter journeys to adjusting the heating or air conditioning. This might be problematic since research has shown that the acceptability of energy-saving behaviors is generally higher for home-related behaviors compared to transport-related behaviors [80] and that certain sub-groups (poorer households) are more likely to use less money on transport and space heating without being more likely to turn off lights, turn down heat or switch appliances to standby on a daily basis [81]. Consequently, the measurements utilized might be inaccurate because they cluster types of behaviors that do not necessarily belong together. Future research should therefore consider whether more differentiated questions are needed.

Conclusion

One key initiative to reach net-zero emissions are changes in energy production and consumption, which has been estimated to account for about 75% of the EU's overall GHG emissions [82]. Our results indicate that high levels of personal and collective outcome expectancy strengthen the relationship between worry and energy curtailment behaviors, while high levels of collective outcome expectancy strengthen the relationship between worry and energy efficiency behaviors. Notably, believing that energy-saving can help reduce climate change does not seem to relate to curtailment or efficiency behaviors for those who are not at all worried about climate change. Based on these findings, campaigns aiming to lower household energy use could communicate the potential positive mitigation impact of individual and collective efforts to save energy, while simultaneously placing an emphasis on making people aware of the risks associated with climate change. If targeting groups that are not likely to worry about climate change, factors other than climate change mitigation, such as lowering the energy bill, might be more effective in motivating energy behaviors. However, conclusions should be made with caution as only a small portion of the variance in energy-saving behaviors was explained by the models.

Acknowledgments

We want to thank Keri Hartman for proofreading the manuscript.

Author Contributions

Conceptualization: Thea Gregersen, Rouven Doran, Gisela Böhm, Wouter Poortinga.

Formal analysis: Thea Gregersen.

Investigation: Gisela Böhm, Wouter Poortinga.

Methodology: Thea Gregersen, Gisela Böhm, Wouter Poortinga.

Project administration: Gisela Böhm, Wouter Poortinga.

Supervision: Rouven Doran, Gisela Böhm.

Validation: Thea Gregersen, Rouven Doran, Gisela Böhm, Wouter Poortinga.

Visualization: Thea Gregersen.

Writing – original draft: Thea Gregersen.

Writing – review & editing: Thea Gregersen, Rouven Doran, Gisela Böhm, Wouter Poortinga.

References

1. European Commission. The European Green Deal. COM(2019) 640 Final.2019.
2. Dietz T, Gardner GT, Gilligan J, Stern PC, Vandenberg MP. Household actions can provide a behavioural wedge to rapidly reduce US carbon emissions. *Proceedings of the National Academy of Sciences*. 2009; 106(44):18452–6. <https://doi.org/10.1073/pnas.0908738106> PMID: 19858494
3. Gardner GT, Stern PC. The short list: The most effective actions US households can take to curb climate change. *Environment: science and policy for sustainable development*. 2008; 50(5):12–25. <https://doi.org/10.3200/ENVT.50.5.12-25>
4. Kneebone S, Fielding K, Smith L. It's what you do and where you do it: Perceived similarity in household water saving behaviours. *Journal of Environmental Psychology*. 2018; 55:1–10. <https://doi.org/10.1016/j.jenvp.2017.10.007>
5. Boudet HS, Flora JA, Armel KC. Clustering household energy-saving behaviours by behavioural attribute. *Energy Policy*. 2016; 92:444–54. <https://doi.org/10.1016/j.enpol.2016.02.033>
6. «Total final consumption (TFC) by sector, Europe 1990–2017» [Internet]. IEA. 2020. Available from: <https://www.iea.org/data-and-statistics?country=WEOEUR&fuel=Energy%20consumption&indicator=TFCShareBySector>.
7. Abrahamse W, Steg L. Factors related to household energy use and intention to reduce it: The role of psychological and socio-demographic variables. *Human Ecology Review*. 2011; 18(1):30–40.
8. Whitmarsh L, O'Neill S. Green identity, green living? The role of pro-environmental self-identity in determining consistency across diverse pro-environmental behaviours. *Journal of Environmental Psychology*. 2010; 30(3):305–14. <https://doi.org/10.1016/j.jenvp.2010.01.003>
9. Liobikienė G, Mineigaitė A. Energy and resource-saving behaviours in European Union countries: The Campbell paradigm and goal framing theory approaches. *Science of The Total Environment*. 2021; 750:141745. <https://doi.org/10.1016/j.scitotenv.2020.141745> PMID: 33182163
10. Hori S, Kondo K, Nogata D, Ben H. The determinants of household energy-saving behavior: Survey and comparison in five major Asian cities. *Energy Policy*. 2013; 52:354–62. <https://doi.org/10.1016/j.enpol.2012.09.043>
11. Han MS, Cudjoe D. Determinants of energy-saving behavior of urban residents: Evidence from Myanmar. *Energy Policy*. 2020; 140:111405. <https://doi.org/10.1016/j.enpol.2020.111405>
12. Wang Z, Zhang B, Yin J, Zhang Y. Determinants and policy implications for household electricity-saving behaviour: Evidence from Beijing, China. *Energy Policy*. 2011; 39(6):3550–7. <https://doi.org/10.1016/j.enpol.2011.03.055>
13. Yang S, Zhang Y, Zhao D. Who exhibits more energy-saving behavior in direct and indirect ways in China? The role of psychological factors and socio-demographics. *Energy Policy*. 2016; 93:196–205. <https://doi.org/10.1016/j.enpol.2016.02.018>
14. Rogers RW. A protection motivation theory of fear appeals and attitude change. *The Journal of Psychology*. 1975; 91(1):93–114. <https://doi.org/10.1080/00223980.1975.9915803> PMID: 28136248
15. Lazarus RS, Folkman S. *Stress, appraisal, and coping*: Springer publishing company; 1984.
16. Floyd DL, Prentice-Dunn S, Rogers RW. A meta-analysis of research on protection motivation theory. *Journal of Applied Social Psychology*. 2000; 30(2):407–29. <https://doi.org/10.1111/j.1559-1816.2000.tb02323.x>
17. Sheeran P, Harris PR, Epton T. Does heightening risk appraisals change people's intentions and behavior? A meta-analysis of experimental studies. *Psychological Bulletin*. 2014; 140(2):511. <https://doi.org/10.1037/a00333065> PMID: 23731175
18. Homburg A, Stolberg A. Explaining pro-environmental behavior with a cognitive theory of stress. *Journal of Environmental Psychology*. 2006; 26(1):1–14. <https://doi.org/10.1016/j.jenvp.2006.03.003>
19. Chen M-F. Self-efficacy or collective efficacy within the cognitive theory of stress model: Which more effectively explains people's self-reported proenvironmental behavior? *Journal of Environmental Psychology*. 2015; 42:66–75. <https://doi.org/10.1016/j.jenvp.2015.02.002>
20. Kothe EJ, Ling M, North M, Klas A, Mullan BA, Novoradovskaya L. Protection motivation theory and pro-environmental behaviour: A systematic mapping review. *Australian Journal of Psychology*. 2019; 71(4):411–32. <https://doi.org/10.1111/ajpy.12271>

21. Van der Linden S. Determinants and measurement of climate change risk perception, worry, and concern. In: Nisbet MS M.C., Markowitz E., Ho S., O'Neill S., Thaker J., editor. *The Oxford Encyclopedia of Climate Change Communication*. Oxford, UK: Oxford University Press; 2017.
22. Spence A, Poortinga W, Butler C, Pidgeon NF. Perceptions of climate change and willingness to save energy related to flood experience. *Nature Climate Change*. 2011; 1(1):46. <https://doi.org/10.1038/NCLIMATE1059>
23. Nauges C, Wheeler SA. The complex relationship between households' climate change concerns and their water and energy mitigation behaviour. *Ecological Economics*. 2017; 141:87–94. <https://doi.org/10.1016/j.ecolecon.2017.05.026>
24. Wicker P, Becken S. Conscientious vs. ambivalent consumers: Do concerns about energy availability and climate change influence consumer behaviour? *Ecological Economics*. 2013; 88:41–8. <https://doi.org/10.1016/j.ecolecon.2013.01.005>
25. Bouman T, Verschoor M, Albers CJ, Böhm G, Fisher SD, Poortinga W, et al. When worry about climate change leads to climate action: How values, worry and personal responsibility relate to various climate actions. *Global Environmental Change*. 2020; 62:102061. <https://doi.org/10.1016/j.gloenvcha.2020.102061>
26. Umit R, Poortinga W, Jokinen P, Pohjolainen P. The role of income in energy efficiency and curtailment behaviours: Findings from 22 European countries. *Energy Research & Social Science*. 2019; 53:206–14. <https://doi.org/10.1016/j.erss.2019.02.025>
27. Steg L. Promoting household energy conservation. *Energy Policy*. 2008; 36(12):4449–53. <https://doi.org/10.1016/j.enpol.2008.09.027>
28. Gifford R. The dragons of inaction: Psychological barriers that limit climate change mitigation and adaptation. *American Psychologist*. 2011; 66(4):290–302. <https://doi.org/10.1037/a0023566> PMID: 21553954
29. Geiger N, Middlewood B, Swim J. Psychological, social, and cultural barriers to communicating about climate change. *The Oxford Encyclopedia of Climate Science*. New York, NY: Oxford University Press; 2020.
30. Bandura A. Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*. 1977; 84(2):191. <https://doi.org/10.1037//0033-295x.84.2.191> PMID: 847061
31. Maddux JE, Rogers RW. Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of Experimental Social Psychology*. 1983; 19(5):469–79. [https://doi.org/10.1016/0022-1031\(83\)90023-9](https://doi.org/10.1016/0022-1031(83)90023-9)
32. Clement CA, Henning JB, Osbaldiston R. Integrating factors that predict energy conservation: the theory of planned behavior and beliefs about climate change. *Journal of Sustainable Development*. 2014; 7(6). <https://doi.org/10.5539/jsd.v7n6p46>
33. Hanss D, Böhm G. Can I make a difference? The role of general and domain-specific self-efficacy in sustainable consumption decisions. *Umweltpsychologie*. 2010; 14:46–74.
34. Hanss D, Böhm G, Doran R, Homburg A. Sustainable Consumption of Groceries: the Importance of Believing that One Can Contribute to Sustainable Development. *Sustainable Development*. 2016; 24(6):357–70. <https://doi.org/10.1002/sd.1615>
35. Moussaoui LS, Desrichard O. Act local but don't think too global: The impact of ecological goal level on behavior. *The Journal of Social Psychology*. 2016; 156(5):536–52. <https://doi.org/10.1080/00224545.2015.1135780> PMID: 26734765
36. Van Valkengoed AM, Steg L. Meta-analyses of factors motivating climate change adaptation behaviour. *Nature Climate Change*. 2019; 9(2):158–63. <https://doi.org/10.1038/s41558-018-0371-y>
37. Kellstedt PM, Zahran S, Vedlitz A. Personal efficacy, the information environment, and attitudes toward global warming and climate change in the United States. *Risk Analysis: An International Journal*. 2008; 28(1):113–26. <https://doi.org/10.1111/j.1539-6924.2008.01010.x> PMID: 18304110
38. Brody S, Grover H, Vedlitz A. Examining the willingness of Americans to alter behaviour to mitigate climate change. *Climate Policy*. 2012; 12(1):1–22. <https://doi.org/10.1080/14693062.2011.579261>
39. Mead E, Roser-Renouf C, Rimal RN, Flora JA, Maibach EW, Leiserowitz A. Information seeking about global climate change among adolescents: The role of risk perceptions, Efficacy Beliefs, and Parental Influences. *Atlantic Journal of Communication*. 2012; 20(1):31–52. <https://doi.org/10.1080/15456870.2012.637027> PMID: 22866024
40. Milfont TL. The interplay between knowledge, perceived efficacy, and concern about global warming and climate change: A one-year longitudinal study. *Risk Analysis*. 2012; 32(6):1003–20. <https://doi.org/10.1111/j.1539-6924.2012.01800.x> PMID: 22489642

41. Koletsou A, Mancy R. Which efficacy constructs for large-scale social dilemma problems? Individual and collective forms of efficacy and outcome expectancies in the context of climate change mitigation. *Risk Management*. 2011; 13(4):184–208. <https://doi.org/10.1057/rm.2011.12>
42. Lubell M, Zahran S, Vedlitz A. Collective action and citizen responses to global warming. *Political Behavior*. 2007; 29(3):391–413. <https://doi.org/10.1007/s11109-006-9025-2>
43. Bostrom A, Hayes AL, Crosman KM. Efficacy, Action, and Support for Reducing Climate Change Risks. *Risk Analysis*. 2019; 39(4):805–28. <https://doi.org/10.1111/risa.13210> PMID: 30368853
44. Doherty KL, Webler TN. Social norms and efficacy beliefs drive the Alarmed segment's public-sphere climate actions. *Nature Climate Change*. 2016; 6(9):879–84. <https://doi.org/10.1038/nclimate3025>
45. Boniface L, Henley N. 'A drop in the bucket': Collective efficacy perceptions and environmental behaviour. *Australian Journal of Social Issues*. 2008; 43(3):345–58. <https://doi.org/10.1002/j.1839-4655.2008.tb00107.x>
46. Barth M, Jugert P, Fritsche I. Still underdetected—social norms and collective efficacy predict the acceptance of electric vehicles in Germany. *Transportation Research Part F: traffic psychology and behaviour*. 2016; 37:64–77. <https://doi.org/10.1016/j.trf.2015.11.011>
47. Reese G, Junge EA. Keep on rockin' in a (plastic-)free world: Collective efficacy and pro-environmental intentions as a function of task difficulty. *Sustainability*. 2017; 9(2):200. <https://doi.org/10.3390/su9020200>
48. Hamann KRS, Reese G. My influence on the world (of others): Goal efficacy beliefs and efficacy affect predict private, public, and activist pro-environmental behavior. *Journal of Social Issues*. 2020. <https://doi.org/10.1111/josi.12369>
49. Jugert P, Greenaway KH, Barth M, Büchner R, Eisentraut S, Fritsche I. Collective efficacy increases pro-environmental intentions through increasing self-efficacy. *Journal of Environmental Psychology*. 2016; 48:12–23. <https://doi.org/10.1016/j.jenvp.2016.08.003>
50. Smith N, Leiserowitz A. The role of emotion in global warming policy support and opposition. *Risk Analysis*. 2014; 34(5):937–48. <https://doi.org/10.1111/risa.12140> PMID: 24219420
51. Van Zomerem M, Spears R, Leach CW. Experimental evidence for a dual pathway model analysis of coping with the climate crisis. *Journal of Environmental Psychology*. 2010; 30(4):339–46. <https://doi.org/10.1016/j.jenvp.2010.02.006>
52. Lorenzoni I, Nicholson-Cole S, Whitmarsh L. Barriers perceived to engaging with climate change among the UK public and their policy implications. *Global Environmental Change*. 2007; 17(3–4):445–59. <https://doi.org/10.1016/j.gloenvcha.2007.01.004>
53. Stoll-Kleemann S, O'Riordan T, Jaeger CC. The psychology of denial concerning climate mitigation measures: evidence from Swiss focus groups. *Global Environmental Change*. 2001; 11(2):107–17. [https://doi.org/10.1016/S0959-3780\(00\)00061-3](https://doi.org/10.1016/S0959-3780(00)00061-3)
54. Maloney EK, Lapinski MK, Witte K. Fear appeals and persuasion: A review and update of the extended parallel process model. *Social and Personality Psychology Compass*. 2011; 5(4):206–19. <https://doi.org/10.1111/j.1751-9004.2011.00341.x>
55. Witte K, Allen M. A meta-analysis of fear appeals: Implications for effective public health campaigns. *Health Education & Behavior*. 2000; 27(5):591–615. <https://doi.org/10.1177/109019810002700506> PMID: 11009129
56. Feinberg M, Willer R. Apocalypse soon?: Dire messages reduce belief in global warming by contradicting just-world beliefs. *Psychological Science*. 2011; 22(1):34–8. <https://doi.org/10.1177/0956797610391911> PMID: 21148457
57. Tannenbaum MB, Hepler J, Zimmerman RS, Saul L, Jacobs S, Wilson K, et al. Appealing to fear: A meta-analysis of fear appeal effectiveness and theories. *Psychol Bull*. 2015; 141(6):1178–204. Epub 2015/10/27. <https://doi.org/10.1037/a0039729> PMID: 26501228
58. Reeve J. Personal control beliefs. *Understanding motivation and emotion*. 6th ed. New York: Wiley; 2015. p. 268–302.
59. Lazarus RS, Folkman S. Transactional theory and research on emotions and coping. *European Journal of Personality*. 1987; 1(3, Spec Issue):141–69. <https://doi.org/10.1002/per.2410010304>
60. Pelletier LG, Dion S, Tuson K, Green-Demers I. Why do people fail to adopt environmental protective behaviors? Toward a taxonomy of environmental motivation. *Journal of Applied Social Psychology*. 1999; 29(12):2481–504. <https://doi.org/10.1111/j.1559-1816.1999.tb00122.x>
61. Xue W, Hine DW, Marks ADG, Phillips WJ, Nunn P, Zhao S. Combining threat and efficacy messaging to increase public engagement with climate change in Beijing, China. *Climatic Change*. 2016; 137(1):43–55. <https://doi.org/10.1007/s10584-016-1678-1>
62. Hox JJ, Moerbeek M, Van de Schoot R. *Multilevel analysis: Techniques and applications*. Third ed. New York, NY: Routledge; 2017.

63. European Social Survey. Data file edition 2.0. NSD—Norwegian Centre for Research Data, Norway—Data Archive and distributor of ESS data for ESS ERIC 2016.
64. European Social Survey. ESS Round 8 (2016/2017) Technical Report. London: ESS ERIC; 2018.
65. Gregersen T, Doran R, Böhm G, Tvinnereim E, Poortinga W. Political orientation moderates the relationship between climate change beliefs and worry about climate change. *Frontiers in Psychology*. 2020; 11(1573). <https://doi.org/10.3389/fpsyg.2020.01573> PMID: 32765360
66. Rabe-Hesketh S, Skrondal A. Multilevel and longitudinal modeling using stata. Third Edition ed: Stata Press; 2012.
67. Cohen J. Statistical power analysis for the social sciences. 2 ed. Hillsdale, NJ: Lawrence Earlbaum Associates.; 1988.
68. Bliese PD. Group size, ICC values, and group-level correlations: A simulation. *Organizational Research Methods*. 1998; 1(4):355–73. <https://doi.org/10.1177/109442819814001>
69. Huang FL. Multilevel modeling myths. *School Psychology Quarterly*. 2018; 33(3):492–9. <https://doi.org/10.1037/spq0000272> PMID: 30070555
70. Verschoor M, Albers C, Poortinga W, Böhm G, Steg L. Exploring relationships between climate change beliefs and energy preferences: A network analysis of the European Social Survey. *Journal of Environmental Psychology*. 2020:101435. <https://doi.org/10.1016/j.jenvp.2020.101435>
71. O'Neill S, Nicholson-Cole S. "Fear won't do it": Promoting positive engagement with climate change through visual and iconic representations. *Science Communication*. 2009; 30(3):355–79. <https://doi.org/10.1177/1075547008329201>
72. Ogunbode CA, Doran R, Böhm G. Exposure to the IPCC special report on 1.5°C global warming is linked to perceived threat and increased concern about climate change. *Climatic Change*. 2020; 158(3):361–75. <https://doi.org/10.1007/s10584-019-02609-0>
73. Bostrom A, Böhm G, O'Connor RE. Communicating risks: Principles and challenges. In: Raue M, Lerner E, Streicher B, editors. *Psychological Perspectives on Risk and Risk Analysis: Theory, Models, and Applications*. New York: Springer 2018. p. 251–77.
74. Götz FM, Gosling SD, Rentfrow J. Small effects: The indispensable foundation for a cumulative psychological science [Preprint]. 2021 [cited 2021 January 28]. Available from: <https://psyarxiv.com/hzrx/f/>
75. Leiserowitz A. Climate change risk perception and policy preferences: The role of affect, imagery, and values. *Climatic Change*. 2006; 77(1):45–72. <https://doi.org/10.1007/s10584-006-9059-9>
76. Kempton W. Will public environmental concern lead to action on global warming? *Annual Review of Energy and the Environment*. 1993; 18(1):217–45. <https://doi.org/10.1146/annurev.eq.18.110193.001245>
77. Zhang C-Y, Yu B, Wang J-W, Wei Y-M. Impact factors of household energy-saving behavior: An empirical study of Shandong Province in China. *Journal of Cleaner Production*. 2018; 185:285–98. <https://doi.org/10.1016/j.jclepro.2018.02.303>
78. Lundberg DC, Tang JA, Attari SZ. Easy but not effective: Why "turning off the lights" remains a salient energy conserving behaviour in the United States. *Energy Research & Social Science*. 2019; 58:101257. <https://doi.org/10.1016/j.erss.2019.101257>
79. Kormos C, Gifford R. The validity of self-report measures of proenvironmental behavior: A meta-analytic review. *Journal of Environmental Psychology*. 2014; 40:359–71. <https://doi.org/10.1016/j.jenvp.2014.09.003>
80. Poortinga W, Steg L, Vlek C, Wiersma G. Household preferences for energy-saving measures: A conjoint analysis. *Journal of Economic Psychology*. 2003; 24(1):49–64. [https://doi.org/10.1016/S0167-4870\(02\)00154-X](https://doi.org/10.1016/S0167-4870(02)00154-X)
81. Cayla J-M, Maizi N, Marchand C. The role of income in energy consumption behaviour: Evidence from French households data. *Energy Policy*. 2011; 39(12):7874–83. <https://doi.org/10.1016/j.enpol.2011.09.036>
82. European Commission. A clean planet for all: A European strategic long-term vision for a prosperous, modern, competitive and climate neutral economy. COM(2018) 773 Final 2018.

Doctoral Theses at The Faculty of Psychology,
University of Bergen

1980	Allen, Hugh M., Dr. philos.	Parent-offspring interactions in willow grouse (<i>Lagopus L. Lagopus</i>).
1981	Myhrer, Trond, Dr. philos.	Behavioral Studies after selective disruption of hippocampal inputs in albino rats.
1982	Svebak, Sven, Dr. philos.	The significance of motivation for task-induced tonic physiological changes.
1983	Myhre, Grete, Dr. philos.	The Biopsychology of behavior in captive Willow ptarmigan.
	Eide, Rolf, Dr. philos.	PSYCHOSOCIAL FACTORS AND INDICES OF HEALTH RISKS. The relationship of psychosocial conditions to subjective complaints, arterial blood pressure, serum cholesterol, serum triglycerides and urinary catecholamines in middle aged populations in Western Norway.
	Værnes, Ragnar J., Dr. philos.	Neuropsychological effects of diving.
1984	Kolstad, Arnulf, Dr. philos.	Til diskusjonen om sammenhengen mellom sosiale forhold og psykiske strukturer. En epidemiologisk undersøkelse blant barn og unge.
	Løberg, Tor, Dr. philos.	Neuropsychological assessment in alcohol dependence.
1985	Hellesnes, Tore, Dr. philos.	Læring og problemløsning. En studie av den perseptuelle analysens betydning for verbal læring.
	Håland, Wenche, Dr. philos.	Psykoterapi: relasjon, utviklingsprosess og effekt.
1986	Hagtvet, Knut A., Dr. philos.	The construct of test anxiety: Conceptual and methodological issues.
	Jellestad, Finn K., Dr. philos.	Effects of neuron specific amygdala lesions on fear-motivated behavior in rats.
1987	Aarø, Leif E., Dr. philos.	Health behaviour and socioeconomic Status. A survey among the adult population in Norway.
	Underlid, Kjell, Dr. philos.	Arbeidsløse i psykososialt perspektiv.
	Laberg, Jon C., Dr. philos.	Expectancy and classical conditioning in alcoholics' craving.
	Vollmer, Fred, Dr. philos.	Essays on explanation in psychology.
	Ellertsen, Bjørn, Dr. philos.	Migraine and tension headache: Psychophysiology, personality and therapy.
1988	Kaufmann, Astrid, Dr. philos.	Antisocial atferd hos ungdom. En studie av psykologiske determinanter.

	Mykletun, Reidar J., Dr. philos.	Teacher stress: personality, work-load and health.
	Havik, Odd E., Dr. philos.	After the myocardial infarction: A medical and psychological study with special emphasis on perceived illness.
1989	Bråten, Stein, Dr. philos.	Menneskedyaden. En teoretisk tese om sinnets dialogiske natur med informasjons- og utviklingspsykologiske implikasjoner sammenholdt med utvalgte spedbarnsstudier.
	Wold, Bente, Dr. psychol.	Lifestyles and physical activity. A theoretical and empirical analysis of socialization among children and adolescents.
1990	Flaten, Magne A., Dr. psychol.	The role of habituation and learning in reflex modification.
1991	Alsaker, Françoise D., Dr. philos.	Global negative self-evaluations in early adolescence.
	Kraft, Pål, Dr. philos.	AIDS prevention in Norway. Empirical studies on diffusion of knowledge, public opinion, and sexual behaviour.
	Endresen, Inger M., Dr. philos.	Psychoimmunological stress markers in working life.
	Faleide, Asbjørn O., Dr. philos.	Asthma and allergy in childhood. Psychosocial and psychotherapeutic problems.
1992	Dalen, Knut, Dr. philos.	Hemispheric asymmetry and the Dual-Task Paradigm: An experimental approach.
	Bø, Inge B., Dr. philos.	Ungdoms sosiale økologi. En undersøkelse av 14-16 åringers sosiale nettverk.
	Nivison, Mary E., Dr. philos.	The relationship between noise as an experimental and environmental stressor, physiological changes and psychological factors.
	Torgersen, Anne M., Dr. philos.	Genetic and environmental influence on temperamental behaviour. A longitudinal study of twins from infancy to adolescence.
1993	Larsen, Svein, Dr. philos.	Cultural background and problem drinking.
	Nordhus, Inger Hilde, Dr. philos.	Family caregiving. A community psychological study with special emphasis on clinical interventions.
	Thuen, Frode, Dr. psychol.	Accident-related behaviour among children and young adolescents: Prediction and prevention.
	Solheim, Ragnar, Dr. philos.	Spesifikke lærevansker. Diskrepanskriteriet anvendt i seleksjonsmetodikk.
	Johnsen, Bjørn Helge, Dr. psychol.	Brain asymmetry and facial emotional expressions: Conditioning experiments.
1994	Tønnessen, Finn E., Dr. philos.	The etiology of Dyslexia.
	Kvale, Gerd, Dr. psychol.	Psychological factors in anticipatory nausea and vomiting in cancer chemotherapy.
	Asbjørnsen, Arve E., Dr. psychol.	Structural and dynamic factors in dichotic listening: An interactional model.

	Bru, Edvin, Dr. philos.	The role of psychological factors in neck, shoulder and low back pain among female hospitale staff.
	Braathen, Eli T., Dr. psychol.	Prediction of exellence and discontinuation in different types of sport: The significance of motivation and EMG.
	Johannessen, Birte F., Dr. philos.	Det flytende kjønnnet. Om lederskap, politikk og identitet.
1995	Sam, David L., Dr. psychol.	Acculturation of young immigrants in Norway: A psychological and socio-cultural adaptation.
	Bjaalid, Inger-Kristin, Dr. philos.	Component processes in word recognition.
	Martinsen, Øyvind, Dr. philos.	Cognitive style and insight.
	Nordby, Helge, Dr. philos.	Processing of auditory deviant events: Mismatch negativity of event-related brain potentials.
	Raaheim, Arild, Dr. philos.	Health perception and health behaviour, theoretical considerations, empirical studies, and practical implications.
	Seltzer, Wencke J., Dr. philos.	Studies of Psychocultural Approach to Families in Therapy.
	Brun, Wibecke, Dr. philos.	Subjective conceptions of uncertainty and risk.
	Aas, Henrik N., Dr. psychol.	Alcohol expectancies and socialization: Adolescents learning to drink.
	Bjørkly, Stål, Dr. psychol.	Diagnosis and prediction of intra-institutional aggressive behaviour in psychotic patients
1996	Anderssen, Norman, Dr. psychol.	Physical activity of young people in a health perspective: Stability, change and social influences.
	Sandal, Gro Mjeldheim, Dr. psychol.	Coping in extreme environments: The role of personality.
	Strumse, Einar, Dr. philos.	The psychology of aesthetics: explaining visual preferences for agrarian landscapes in Western Norway.
	Hestad, Knut, Dr. philos.	Neuropsychological deficits in HIV-1 infection.
	Lugoe, L.Wycliffe, Dr. philos.	Prediction of Tanzanian students' HIV risk and preventive behaviours
	Sandvik, B. Gunnhild, Dr. philos.	Fra distriktsjordmor til institusjonsjordmor. Fremveksten av en profesjon og en profesjonsutdanning
	Lie, Gro Therese, Dr. psychol.	The disease that dares not speak its name: Studies on factors of importance for coping with HIV/AIDS in Northern Tanzania
	Øygaard, Lisbet, Dr. philos.	Health behaviors among young adults. A psychological and sociological approach
	Stormark, Kjell Morten, Dr. psychol.	Emotional modulation of selective attention: Experimental and clinical evidence.
	Einarsen, Ståle, Dr. psychol.	Bullying and harassment at work: epidemiological and psychosocial aspects.

1997	Knivsberg, Ann-Mari, Dr. philos.	Behavioural abnormalities and childhood psychopathology: Urinary peptide patterns as a potential tool in diagnosis and remediation.
	Eide, Arne H., Dr. philos.	Adolescent drug use in Zimbabwe. Cultural orientation in a global-local perspective and use of psychoactive substances among secondary school students.
	Sørensen, Marit, Dr. philos.	The psychology of initiating and maintaining exercise and diet behaviour.
	Skjæveland, Oddvar, Dr. psychol.	Relationships between spatial-physical neighborhood attributes and social relations among neighbors.
	Zewdie, Teka, Dr. philos.	Mother-child relational patterns in Ethiopia. Issues of developmental theories and intervention programs.
	Wilhelmsen, Britt Unni, Dr. philos.	Development and evaluation of two educational programmes designed to prevent alcohol use among adolescents.
	Manger, Terje, Dr. philos.	Gender differences in mathematical achievement among Norwegian elementary school students.
1998	Lindstrøm, Torill Christine, Dr. philos.	«Good Grief»: Adapting to Bereavement.
V	Skogstad, Anders, Dr. philos.	Effects of leadership behaviour on job satisfaction, health and efficiency.
	Haldorsen, Ellen M. Håland, Dr. psychol.	Return to work in low back pain patients.
	Besemer, Susan P., Dr. philos.	Creative Product Analysis: The Search for a Valid Model for Understanding Creativity in Products.
H	Winje, Dagfinn, Dr. psychol.	Psychological adjustment after severe trauma. A longitudinal study of adults' and children's posttraumatic reactions and coping after the bus accident in Måbødalen, Norway 1988.
	Vosburg, Suzanne K., Dr. philos.	The effects of mood on creative problem solving.
	Eriksen, Hege R., Dr. philos.	Stress and coping: Does it really matter for subjective health complaints?
	Jakobsen, Reidar, Dr. psychol.	Empiriske studier av kunnskap og holdninger om hiv/aids og den normative seksuelle utvikling i ungdomsårene.
1999	Mikkelsen, Aslaug, Dr. philos.	Effects of learning opportunities and learning climate on occupational health.
V	Samdal, Oddrun, Dr. philos.	The school environment as a risk or resource for students' health-related behaviours and subjective well-being.
	Friestad, Christine, Dr. philos.	Social psychological approaches to smoking.
	Ekeland, Tor-Johan, Dr. philos.	Meining som medisin. Ein analyse av placebofenomenet og implikasjoner for terapi og terapeutiske teoriar.
H	Saban, Sara, Dr. psychol.	Brain Asymmetry and Attention: Classical Conditioning Experiments.

	Carlsten, Carl Thomas, Dr. philos.	God lesing – God læring. En aksjonsrettet studie av undervisning i fagtekstlesing.
	Dundas, Ingrid, Dr. psychol.	Functional and dysfunctional closeness. Family interaction and children's adjustment.
	Engen, Liv, Dr. philos.	Kartlegging av leseferdighet på småskoletrinnet og vurdering av faktorer som kan være av betydning for optimal leseutvikling.
2000 V	Hovland, Ole Johan, Dr. philos.	Transforming a self-preserving "alarm" reaction into a self-defeating emotional response: Toward an integrative approach to anxiety as a human phenomenon.
	Lillejord, Sølvi, Dr. philos.	Handlingsrasjonalitet og spesialundervisning. En analyse av aktørperspektiver.
	Sandell, Ove, Dr. philos.	Den varme kunnskapen.
	Oftedal, Marit Petersen, Dr. philos.	Diagnostisering av ordavkodingsvansker: En prosessanalytisk tilnæringsmåte.
H	Sandbak, Tone, Dr. psychol.	Alcohol consumption and preference in the rat: The significance of individual differences and relationships to stress pathology
	Eid, Jarle, Dr. psychol.	Early predictors of PTSD symptom reporting; The significance of contextual and individual factors.
2001 V	Skinstad, Anne Helene, Dr. philos.	Substance dependence and borderline personality disorders.
	Binder, Per-Einar, Dr. psychol.	Individet og den meningsbærende andre. En teoretisk undersøkelse av de mellommenneskelige forutsetningene for psykisk liv og utvikling med utgangspunkt i Donald Winnicotts teori.
	Roald, Ingvild K., Dr. philos.	Building of concepts. A study of Physics concepts of Norwegian deaf students.
H	Fekadu, Zelalem W., Dr. philos.	Predicting contraceptive use and intention among a sample of adolescent girls. An application of the theory of planned behaviour in Ethiopian context.
	Melesse, Fantu, Dr. philos.	The more intelligent and sensitive child (MISC) mediational intervention in an Ethiopian context: An evaluation study.
	Råheim, Målfrid, Dr. philos.	Kvinnerens kroppserfaring og livssammenheng. En fenomenologisk – hermeneutisk studie av friske kvinner og kvinner med kroniske muskelsmerter.
	Engelsen, Birthe Kari, Dr. psychol.	Measurement of the eating problem construct.
	Lau, Bjørn, Dr. philos.	Weight and eating concerns in adolescence.
2002 V	Ihlebak, Camilla, Dr. philos.	Epidemiological studies of subjective health complaints.
	Rosén, Gunnar O. R., Dr. philos.	The phantom limb experience. Models for understanding and treatment of pain with hypnosis.

	Høines, Marit Johnsen, Dr. philos.	Fleksible språkrrom. Matematikklæring som tekstutvikling.
	Anthun, Roald Andor, Dr. philos.	School psychology service quality. Consumer appraisal, quality dimensions, and collaborative improvement potential
	Pallesen, Ståle, Dr. psychol.	Insomnia in the elderly. Epidemiology, psychological characteristics and treatment.
	Midthassel, Unni Vere, Dr. philos.	Teacher involvement in school development activity. A study of teachers in Norwegian compulsory schools
	Kallestad, Jan Helge, Dr. philos.	Teachers, schools and implementation of the Olweus Bullying Prevention Program.
H	Ofte, Sonja Helgesen, Dr. psychol.	Right-left discrimination in adults and children.
	Netland, Marit, Dr. psychol.	Exposure to political violence. The need to estimate our estimations.
	Diseth, Åge, Dr. psychol.	Approaches to learning: Validity and prediction of academic performance.
	Bjuland, Raymond, Dr. philos.	Problem solving in geometry. Reasoning processes of student teachers working in small groups: A dialogical approach.
2003 V	Arefjord, Kjersti, Dr. psychol.	After the myocardial infarction – the wives' view. Short- and long-term adjustment in wives of myocardial infarction patients.
	Ingjaldsson, Jón Þorvaldur, Dr. psychol.	Unconscious Processes and Vagal Activity in Alcohol Dependency.
	Holden, Børge, Dr. philos.	Følger av atferdsanalytiske forklaringer for atferdsanalysens tilnærming til utforming av behandling.
	Holsen, Ingrid, Dr. philos.	Depressed mood from adolescence to 'emerging adulthood'. Course and longitudinal influences of body image and parent-adolescent relationship.
	Hammar, Åsa Karin, Dr. psychol.	Major depression and cognitive dysfunction- An experimental study of the cognitive effort hypothesis.
	Sprugevica, Ieva, Dr. philos.	The impact of enabling skills on early reading acquisition.
	Gabrielsen, Egil, Dr. philos.	LESE FOR LIVET. Lesekompetansen i den norske voksenbefolkningen sett i lys av visjonen om en enhetsskole.
H	Hansen, Anita Lill, Dr. psychol.	The influence of heart rate variability in the regulation of attentional and memory processes.
	Dyregrov, Kari, Dr. philos.	The loss of child by suicide, SIDS, and accidents: Consequences, needs and provisions of help.
2004 V	Torsheim, Torbjørn, Dr. psychol.	Student role strain and subjective health complaints: Individual, contextual, and longitudinal perspectives.
	Haugland, Bente Storm Mowatt Dr. psychol.	Parental alcohol abuse. Family functioning and child adjustment.

	Milde, Anne Marita, Dr. psychol.	Ulcerative colitis and the role of stress. Animal studies of psychobiological factors in relationship to experimentally induced colitis.
	Stornes, Tor, Dr. philos.	Socio-moral behaviour in sport. An investigation of perceptions of sportspersonship in handball related to important factors of socio-moral influence.
	Mæhle, Magne, Dr. philos.	Re-inventing the child in family therapy: An investigation of the relevance and applicability of theory and research in child development for family therapy involving children.
	Kobbeltvedt, Therese, Dr. psychol.	Risk and feelings: A field approach.
2004	Thomsen, Tormod, Dr. psychol.	Localization of attention in the brain.
H	Løberg, Else-Marie, Dr. psychol.	Functional laterality and attention modulation in schizophrenia: Effects of clinical variables.
	Kyrkjebø, Jane Mikkelsen, Dr. philos.	Learning to improve: Integrating continuous quality improvement learning into nursing education.
	Laumann, Karin, Dr. psychol.	Restorative and stress-reducing effects of natural environments: Experiential, behavioural and cardiovascular indices.
	Holgersen, Helge, PhD	Mellom oss - Essay i relasjonell psykoanalyse.
2005	Hetland, Hilde, Dr. psychol.	Leading to the extraordinary? Antecedents and outcomes of transformational leadership.
V	Iversen, Anette Christine, Dr. philos.	Social differences in health behaviour: the motivational role of perceived control and coping.
2005	Mathisen, Gro Ellen, PhD	Climates for creativity and innovation: Definitions, measurement, predictors and consequences.
H	Sævi, Tone, Dr. philos.	Seeing disability pedagogically – The lived experience of disability in the pedagogical encounter.
	Wiium, Nora, PhD	Intrapersonal factors, family and school norms: combined and interactive influence on adolescent smoking behaviour.
	Kanagaratnam, Pushpa, PhD	Subjective and objective correlates of Posttraumatic Stress in immigrants/refugees exposed to political violence.
	Larsen, Torill M. B. , PhD	Evaluating principals` and teachers` implementation of Second Step. A case study of four Norwegian primary schools.
	Bancila, Delia, PhD	Psychosocial stress and distress among Romanian adolescents and adults.
2006	Hillestad, Torgeir Martin, Dr. philos.	Normalitet og avvik. Forutsetninger for et objektivt psykopatologisk avviksbegrep. En psykologisk, sosial, erkjennelsesteoretisk og teorihistorisk framstilling.
V	Nordanger, Dag Øystein, Dr. psychol.	Psychosocial discourses and responses to political violence in post-war Tigray, Ethiopia.

	Rimol, Lars Morten, PhD	Behavioral and fMRI studies of auditory laterality and speech sound processing.
	Krumsvik, Rune Johan, Dr. philos.	ICT in the school. ICT-initiated school development in lower secondary school.
	Norman, Elisabeth, Dr. psychol.	Gut feelings and unconscious thought: An exploration of fringe consciousness in implicit cognition.
	Israel, K Pravin, Dr. psychol.	Parent involvement in the mental health care of children and adolescents. Empirical studies from clinical care setting.
	Glasø, Lars, PhD	Affects and emotional regulation in leader-subordinate relationships.
	Knutsen, Ketil, Dr. philos.	HISTORIER UNGDOM LEVER – En studie av hvordan ungdommer bruker historie for å gjøre livet meningsfullt.
	Matthiesen, Stig Berge, PhD	Bullying at work. Antecedents and outcomes.
2006	Gramstad, Arne, PhD	Neuropsychological assessment of cognitive and emotional functioning in patients with epilepsy.
H	Bendixen, Mons, PhD	Antisocial behaviour in early adolescence: Methodological and substantive issues.
	Mrumbi, Khalifa Maulid, PhD	Parental illness and loss to HIV/AIDS as experienced by AIDS orphans aged between 12-17 years from Temeke District, Dar es Salaam, Tanzania: A study of the children's psychosocial health and coping responses.
	Hetland, Jørn, Dr. psychol.	The nature of subjective health complaints in adolescence: Dimensionality, stability, and psychosocial predictors
	Kakoko, Deodatus Conatus Vitalis, PhD	Voluntary HIV counselling and testing service uptake among primary school teachers in Mwanza, Tanzania: assessment of socio-demographic, psychosocial and socio-cognitive aspects
	Mykletun, Arnstein, Dr. psychol.	Mortality and work-related disability as long-term consequences of anxiety and depression: Historical cohort designs based on the HUNT-2 study
	Sivertsen, Børge, PhD	Insomnia in older adults. Consequences, assessment and treatment.
2007	Singhammer, John, Dr. philos.	Social conditions from before birth to early adulthood – the influence on health and health behaviour
V	Janvin, Carmen Ani Cristea, PhD	Cognitive impairment in patients with Parkinson's disease: profiles and implications for prognosis
	Braarud, Hanne Cecilie, Dr. psychol.	Infant regulation of distress: A longitudinal study of transactions between mothers and infants
	Tveito, Torill Helene, PhD	Sick Leave and Subjective Health Complaints
	Magnussen, Liv Heide, PhD	Returning disability pensioners with back pain to work

	Thuen, Elin Marie, Dr.philos.	Learning environment, students' coping styles and emotional and behavioural problems. A study of Norwegian secondary school students.
	Solberg, Ole Asbjørn, PhD	Peacekeeping warriors – A longitudinal study of Norwegian peacekeepers in Kosovo
2007	Søreide, Gunn Elisabeth, Dr.philos.	Narrative construction of teacher identity
H	Svensen, Erling, PhD	WORK & HEALTH. Cognitive Activation Theory of Stress applied in an organisational setting.
	Øverland, Simon Nygaard, PhD	Mental health and impairment in disability benefits. Studies applying linkages between health surveys and administrative registries.
	Eichele, Tom, PhD	Electrophysiological and Hemodynamic Correlates of Expectancy in Target Processing
	Børhaug, Kjetil, Dr.philos.	Oppseding til demokrati. Ein studie av politisk oppseding i norsk skule.
	Eikeland, Thorleif, Dr.philos.	Om å vokse opp på barnehjem og på sykehus. En undersøkelse av barnehjemsbarns opplevelser på barnehjem sammenholdt med sanatoriebarns beskrivelse av langvarige sykehusopphold – og et forsøk på forklaring.
	Wadel, Carl Cato, Dr.philos.	Medarbeidersamhandling og medarbeiderledelse i en lagbasert organisasjon
	Vinje, Hege Forbech, PhD	Thriving despite adversity: Job engagement and self-care among community nurses
	Noort, Maurits van den, PhD	Working memory capacity and foreign language acquisition
2008	Breivik, Kyrre, Dr.psychol.	The Adjustment of Children and Adolescents in Different Post-Divorce Family Structures. A Norwegian Study of Risks and Mechanisms.
V	Johnsen, Grethe E., PhD	Memory impairment in patients with posttraumatic stress disorder
	Sætrevik, Bjørn, PhD	Cognitive Control in Auditory Processing
	Carvalho, Susana Fonseca, PhD	Prevention of bullying in schools: an ecological model
2008	Brønnick, Kolbjørn Selvåg	Attentional dysfunction in dementia associated with Parkinson's disease.
H	Posserud, Maj-Britt Rocio	Epidemiology of autism spectrum disorders
	Haug, Ellen	Multilevel correlates of physical activity in the school setting
	Skjerve, Arvid	Assessing mild dementia – a study of brief cognitive tests.

	Kjønniksen, Lise	The association between adolescent experiences in physical activity and leisure time physical activity in adulthood: a ten year longitudinal study
	Gundersen, Hilde	The effects of alcohol and expectancy on brain function
	Omvik, Siri	Insomnia – a night and day problem
2009 V	Molde, Helge	Pathological gambling: prevalence, mechanisms and treatment outcome.
	Foss, Else	Den omsorgsfulle væremåte. En studie av voksnes væremåte i forhold til barn i barnehagen.
	Westrheim, Kariane	Education in a Political Context: A study of Knowledge Processes and Learning Sites in the PKK.
	Wehling, Eike	Cognitive and olfactory changes in aging
	Wangberg, Silje C.	Internet based interventions to support health behaviours: The role of self-efficacy.
	Nielsen, Morten B.	Methodological issues in research on workplace bullying. Operationalisations, measurements and samples.
	Sandu, Anca Larisa	MRI measures of brain volume and cortical complexity in clinical groups and during development.
	Guribye, Eugene	Refugees and mental health interventions
	Sørensen, Lin	Emotional problems in inattentive children – effects on cognitive control functions.
	Tjomsland, Hege E.	Health promotion with teachers. Evaluation of the Norwegian Network of Health Promoting Schools: Quantitative and qualitative analyses of predisposing, reinforcing and enabling conditions related to teacher participation and program sustainability.
	Helleve, Ingrid	Productive interactions in ICT supported communities of learners
2009 H	Skorpen, Aina Øye, Christine	Dagliglivet i en psykiatrisk institusjon: En analyse av miljøterapeutiske praksiser
	Andreassen, Cecilie Schou	WORKAHOLISM – Antecedents and Outcomes
	Stang, Ingun	Being in the same boat: An empowerment intervention in breast cancer self-help groups
	Sequeira, Sarah Dorothee Dos Santos	The effects of background noise on asymmetrical speech perception
	Kleiven, Jo, dr.philos.	The Lillehammer scales: Measuring common motives for vacation and leisure behavior
	Jónsdóttir, Guðrún	Dubito ergo sum? Ni jenter møter naturfaglig kunnskap.
	Hove, Oddbjørn	Mental health disorders in adults with intellectual disabilities - Methods of assessment and prevalence of mental health disorders and problem behaviour
	Wageningen, Heidi Karin van	The role of glutamate on brain function

	Bjørkvik, Jofrid	God nok? Selvaktelse og interpersonlig fungering hos pasienter innen psykisk helsevern: Forholdet til diagnoser, symptomer og behandlingsutbytte
	Andersson, Martin	A study of attention control in children and elderly using a forced-attention dichotic listening paradigm
	Almås, Aslaug Grov	Teachers in the Digital Network Society: Visions and Realities. A study of teachers' experiences with the use of ICT in teaching and learning.
	Ulvik, Marit	Lærerutdanning som danning? Tre stemmer i diskusjonen
2010	Skår, Randi	Læringsprosesser i sykepleieres profesjonsutøvelse. En studie av sykepleieres læringserfaringer.
V	Roald, Knut	Kvalitetsvurdering som organisasjonslæring mellom skole og skoleeigar
	Lunde, Linn-Heidi	Chronic pain in older adults. Consequences, assessment and treatment.
	Danielsen, Anne Grete	Perceived psychosocial support, students' self-reported academic initiative and perceived life satisfaction
	Hysing, Mari	Mental health in children with chronic illness
	Olsen, Olav Kjellevod	Are good leaders moral leaders? The relationship between effective military operational leadership and morals
	Riese, Hanne	Friendship and learning. Entrepreneurship education through mini-enterprises.
	Holthe, Asle	Evaluating the implementation of the Norwegian guidelines for healthy school meals: A case study involving three secondary schools
H	Hauge, Lars Johan	Environmental antecedents of workplace bullying: A multi-design approach
	Bjørkelo, Brita	Whistleblowing at work: Antecedents and consequences
	Reme, Silje Endresen	Common Complaints – Common Cure? Psychiatric comorbidity and predictors of treatment outcome in low back pain and irritable bowel syndrome
	Helland, Wenche Andersen	Communication difficulties in children identified with psychiatric problems
	Beneventi, Harald	Neuronal correlates of working memory in dyslexia
	Thygesen, Elin	Subjective health and coping in care-dependent old persons living at home
	Aanes, Mette Marthinussen	Poor social relationships as a threat to belongingness needs. Interpersonal stress and subjective health complaints: Mediating and moderating factors.
	Anker, Morten Gustav	Client directed outcome informed couple therapy

	Bull, Torill	Combining employment and child care: The subjective well-being of single women in Scandinavia and in Southern Europe
	Viiig, Nina Grieg	Tilrettelegging for læreres deltakelse i helsefremmende arbeid. En kvalitativ og kvantitativ analyse av sammenhengen mellom organisatoriske forhold og læreres deltakelse i utvikling og implementering av Europeisk Nettverk av Helsefremmende Skoler i Norge
	Wolff, Katharina	To know or not to know? Attitudes towards receiving genetic information among patients and the general public.
	Ogden, Terje, dr.philos.	Familiebasert behandling av alvorlige atferdsproblemer blant barn og ungdom. Evaluering og implementering av evidensbaserte behandlingsprogrammer i Norge.
	Solberg, Mona Elin	Self-reported bullying and victimisation at school: Prevalence, overlap and psychosocial adjustment.
2011	Bye, Hege Høivik	Self-presentation in job interviews. Individual and cultural differences in applicant self-presentation during job interviews and hiring managers' evaluation
V	Notelaers, Guy	Workplace bullying. A risk control perspective.
	Moltu, Christian	Being a therapist in difficult therapeutic impasses. A hermeneutic phenomenological analysis of skilled psychotherapists' experiences, needs, and strategies in difficult therapies ending well.
	Myrseth, Helga	Pathological Gambling - Treatment and Personality Factors
	Schanche, Elisabeth	From self-criticism to self-compassion. An empirical investigation of hypothesized change processes in the Affect Phobia Treatment Model of short-term dynamic psychotherapy for patients with Cluster C personality disorders.
	Våpenstad, Eystein Victor, dr.philos.	Det tempererte nærvær. En teoretisk undersøkelse av psykoterautens subjektivitet i psykoanalyse og psykoanalytisk psykoterapi.
	Haukebø, Kristin	Cognitive, behavioral and neural correlates of dental and intra-oral injection phobia. Results from one treatment and one fMRI study of randomized, controlled design.
	Harris, Anette	Adaptation and health in extreme and isolated environments. From 78°N to 75°S.
	Bjørknes, Ragnhild	Parent Management Training-Oregon Model: intervention effects on maternal practice and child behavior in ethnic minority families
	Mamen, Asgeir	Aspects of using physical training in patients with substance dependence and additional mental distress
	Espevik, Roar	Expert teams: Do shared mental models of team members make a difference
	Haara, Frode Olav	Unveiling teachers' reasons for choosing practical activities in mathematics teaching

2011 H	Hauge, Hans Abraham	How can employee empowerment be made conducive to both employee health and organisation performance? An empirical investigation of a tailor-made approach to organisation learning in a municipal public service organisation.
	Melkevik, Ole Rogstad	Screen-based sedentary behaviours: pastimes for the poor, inactive and overweight? A cross-national survey of children and adolescents in 39 countries.
	Vøllestad, Jon	Mindfulness-based treatment for anxiety disorders. A quantitative review of the evidence, results from a randomized controlled trial, and a qualitative exploration of patient experiences.
	Tolo, Astrid	Hvordan blir lærerkompetanse konstruert? En kvalitativ studie av PPU-studenters kunnskapsutvikling.
	Saus, Evelyn-Rose	Training effectiveness: Situation awareness training in simulators
	Nordgreen, Tine	Internet-based self-help for social anxiety disorder and panic disorder. Factors associated with effect and use of self-help.
	Munkvold, Linda Helen	Oppositional Defiant Disorder: Informant discrepancies, gender differences, co-occurring mental health problems and neurocognitive function.
	Christiansen, Øivin	Når barn plasseres utenfor hjemmet: beslutninger, forløp og relasjoner. Under barnevernets (ved)tak.
	Brunborg, Geir Scott	Conditionability and Reinforcement Sensitivity in Gambling Behaviour
	Hystad, Sigurd William	Measuring Psychological Resiliency: Validation of an Adapted Norwegian Hardiness Scale
2012 V	Roness, Dag	Hvorfor bli lærer? Motivasjon for utdanning og utøving.
	Fjermestad, Krister Westlye	The therapeutic alliance in cognitive behavioural therapy for youth anxiety disorders
	Jenssen, Eirik Sørnes	Tilpasset opplæring i norsk skole: politikeres, skolelederes og læreres handlingsvalg
	Saksvik-Lehouillier, Ingvild	Shift work tolerance and adaptation to shift work among offshore workers and nurses
	Johansen, Venke Frederike	Når det intime blir offentlig. Om kvinners åpenhet om brystkreft og om markedsføring av brystkreftsaken.
	Herheim, Rune	Pupils collaborating in pairs at a computer in mathematics learning: investigating verbal communication patterns and qualities
	Vie, Tina Løkke	Cognitive appraisal, emotions and subjective health complaints among victims of workplace bullying: A stress-theoretical approach
	Jones, Lise Øen	Effects of reading skills, spelling skills and accompanying efficacy beliefs on participation in education. A study in Norwegian prisons.

2012 H	Danielsen, Yngvild Sørebo	Childhood obesity – characteristics and treatment. Psychological perspectives.
	Horverak, Jøri Gytre	Sense or sensibility in hiring processes. Interviewee and interviewer characteristics as antecedents of immigrant applicants' employment probabilities. An experimental approach.
	Jøsendal, Ola	Development and evaluation of BE smokeFREE, a school-based smoking prevention program
	Osnes, Berge	Temporal and Posterior Frontal Involvement in Auditory Speech Perception
	Drageset, Sigrunn	Psychological distress, coping and social support in the diagnostic and preoperative phase of breast cancer
	Aasland, Merethe Schanke	Destructive leadership: Conceptualization, measurement, prevalence and outcomes
	Bakibinga, Pauline	The experience of job engagement and self-care among Ugandan nurses and midwives
	Skogen, Jens Christoffer	Foetal and early origins of old age health. Linkage between birth records and the old age cohort of the Hordaland Health Study (HUSK)
	Leveresen, Ingrid	Adolescents' leisure activity participation and their life satisfaction: The role of demographic characteristics and psychological processes
	Hanss, Daniel	Explaining sustainable consumption: Findings from cross-sectional and intervention approaches
Rød, Per Arne	Barn i klem mellom foreldrekonflikter og samfunnsmessig beskyttelse	
2013 V	Mentzoni, Rune Aune	Structural Characteristics in Gambling
	Knudsen, Ann Kristin	Long-term sickness absence and disability pension award as consequences of common mental disorders. Epidemiological studies using a population-based health survey and official ill health benefit registries.
	Strand, Mari	Emotional information processing in recurrent MDD
	Veseth, Marius	Recovery in bipolar disorder. A reflexive-collaborative exploration of the lived experiences of healing and growth when battling a severe mental illness
	Mæland, Silje	Sick leave for patients with severe subjective health complaints. Challenges in general practice.
	Mjaaland, Thera	At the frontiers of change? Women and girls' pursuit of education in north-western Tigray, Ethiopia
	Odéen, Magnus	Coping at work. The role of knowledge and coping expectancies in health and sick leave.
	Hynninen, Kia Minna Johanna	Anxiety, depression and sleep disturbance in chronic obstructive pulmonary disease (COPD). Associations, prevalence and effect of psychological treatment.
Flo, Elisabeth	Sleep and health in shift working nurses	

	Aasen, Elin Margrethe	From paternalism to patient participation? The older patients undergoing hemodialysis, their next of kin and the nurses: a discursive perspective on perception of patient participation in dialysis units
	Ekornås, Belinda	Emotional and Behavioural Problems in Children: Self-perception, peer relationships, and motor abilities
	Corbin, J. Hope	North-South Partnerships for Health: Key Factors for Partnership Success from the Perspective of the KIWAKKUKI
	Birkeland, Marianne Skogbrott	Development of global self-esteem: The transition from adolescence to adulthood
2013 H	Gianella-Malca, Camila	Challenges in Implementing the Colombian Constitutional Court's Health-Care System Ruling of 2008
	Hovland, Anders	Panic disorder – Treatment outcomes and psychophysiological concomitants
	Mortensen, Øystein	The transition to parenthood – Couple relationships put to the test
	Årdal, Guro	Major Depressive Disorder – a Ten Year Follow-up Study. Inhibition, Information Processing and Health Related Quality of Life
	Johansen, Rino Bandlitz	The impact of military identity on performance in the Norwegian armed forces
	Bøe, Tormod	Socioeconomic Status and Mental Health in Children and Adolescents
2014 V	Nordmo, Ivar	Gjennom nåløyet – studenters læringserfaringer i psykologutdanningen
	Dovran, Anders	Childhood Trauma and Mental Health Problems in Adult Life
	Hegelstad, Wenche ten Velden	Early Detection and Intervention in Psychosis: A Long-Term Perspective
	Urheim, Ragnar	Forståelse av pasientaggresjon og forklaringer på nedgang i voldsrater ved Regional sikkerhetsavdeling, Sandviken sykehus
	Kinn, Liv Grethe	Round-Trips to Work. Qualitative studies of how persons with severe mental illness experience work integration.
	Rød, Anne Marie Kinn	Consequences of social defeat stress for behaviour and sleep. Short-term and long-term assessments in rats.
	Nygård, Merethe	Schizophrenia – Cognitive Function, Brain Abnormalities, and Cannabis Use
	Tjora, Tore	Smoking from adolescence through adulthood: the role of family, friends, depression and socioeconomic status. Predictors of smoking from age 13 to 30 in the "The Norwegian Longitudinal Health Behaviour Study" (NLHB)
	Vangsnes, Vigdis	The Dramaturgy and Didactics of Computer Gaming. A Study of a Medium in the Educational Context of Kindergartens.

	Nordahl, Kristin Berg	Early Father-Child Interaction in a Father-Friendly Context: Gender Differences, Child Outcomes, and Protective Factors related to Fathers' Parenting Behaviors with One-year-olds
2014 H	Sandvik, Asle Makoto	Psychopathy – the heterogeneity of the construct
	Skotheim, Siv	Maternal emotional distress and early mother-infant interaction: Psychological, social and nutritional contributions
	Halleland, Helene Barone	Executive Functioning in adult Attention Deficit Hyperactivity Disorder (ADHD). From basic mechanisms to functional outcome.
	Halvorsen, Kirsti Vindal	Partnerskap i lærerutdanning, sett fra et økologisk perspektiv
	Solbue, Vibeke	Dialogen som visker ut kategorier. En studie av hvilke erfaringer innvandrerdommer og norskfødte med innvandrereforeldre har med videregående skole. Hva forteller ungdommenes erfaringer om videregående skoles håndtering av etniske ulikheter?
	Kvalevaag, Anne Lise	Fathers' mental health and child development. The predictive value of fathers' psychological distress during pregnancy for the social, emotional and behavioural development of their children
	Sandal, Ann Karin	Ungdom og utdanningsval. Om elevar sine opplevingar av val og overgangsprossessar.
	Haug, Thomas	Predictors and moderators of treatment outcome from high- and low-intensity cognitive behavioral therapy for anxiety disorders. Association between patient and process factors, and the outcome from guided self-help, stepped care, and face-to-face cognitive behavioral therapy.
	Sjølie, Hege	Experiences of Members of a Crisis Resolution Home Treatment Team. Personal history, professional role and emotional support in a CRHT team.
	Falkenberg, Liv Eggset	Neuronal underpinnings of healthy and dysfunctional cognitive control
Mrdalj, Jelena	The early life condition. Importance for sleep, circadian rhythmicity, behaviour and response to later life challenges	
Hesjedal, Elisabeth	Tverrprofesjonelt samarbeid mellom skule og barnevern: Kva kan støtte utsette barn og unge?	
2015 V	Hauken, May Aasebø	« <i>The cancer treatment was only half the work!</i> » A Mixed-Method Study of Rehabilitation among Young Adult Cancer Survivors
	Ryland, Hilde Katrin	Social functioning and mental health in children: the influence of chronic illness and intellectual function
	Rønsen, Anne Kristin	Vurdering som profesjonskompetanse. Refleksjonsbasert utvikling av læreres kompetanse i formativ vurdering

	Hoff, Helge Andreas	Thinking about Symptoms of Psychopathy in Norway: Content Validation of the Comprehensive Assessment of Psychopathic Personality (CAPP) Model in a Norwegian Setting
	Schmid, Marit Therese	Executive Functioning in recurrent- and first episode Major Depressive Disorder. Longitudinal studies
	Sand, Liv	Body Image Distortion and Eating Disturbances in Children and Adolescents
	Matanda, Dennis Juma	Child physical growth and care practices in Kenya: Evidence from Demographic and Health Surveys
	Amugsi, Dickson Abanimi	Child care practices, resources for care, and nutritional outcomes in Ghana: Findings from Demographic and Health Surveys
	Jakobsen, Hilde	The good beating: Social norms supporting men's partner violence in Tanzania
	Sagoe, Dominic	Nonmedical anabolic-androgenic steroid use: Prevalence, attitudes, and social perception
	Eide, Helene Marie Kjærgård	Narrating the relationship between leadership and learning outcomes. A study of public narratives in the Norwegian educational sector.
2015	Wubs, Annegreet Gera	Intimate partner violence among adolescents in South Africa and Tanzania
H	Hjelmervik, Helene Susanne	Sex and sex-hormonal effects on brain organization of fronto-parietal networks
	Dahl, Berit Misund	The meaning of professional identity in public health nursing
	Røykenes, Kari	Testangst hos sykepleierstudenter: «Alternativ behandling»
	Bless, Josef Johann	The smartphone as a research tool in psychology. Assessment of language lateralization and training of auditory attention.
	Løvvik, Camilla Margrethe Sigvaldsen	Common mental disorders and work participation – the role of return-to-work expectations
	Lehmann, Stine	Mental Disorders in Foster Children: A Study of Prevalence, Comorbidity, and Risk Factors
	Knapstad, Marit	Psychological factors in long-term sickness absence: the role of shame and social support. Epidemiological studies based on the Health Assets Project.
2016	Kvestad, Ingrid	Biological risks and neurodevelopment in young North Indian children
V	Sælør, Knut Tore	Hinderløyper, halmstrå og hengende snører. En kvalitativ studie av håp innenfor psykisk helse- og rusfeltet.
	Mellingen, Sonja	Alkoholbruk, partilfredshet og samlivsstatus. Før, inn i, og etter svangerskapet – korrelerer eller konsekvenser?
	Thun, Eirunn	Shift work: negative consequences and protective factors

	Hilt, Line Torbjørnsen	The borderlands of educational inclusion. Analyses of inclusion and exclusion processes for minority language students
	Havnen, Audun	Treatment of obsessive-compulsive disorder and the importance of assessing clinical effectiveness
	Slåtten, Hilde	Gay-related name-calling among young adolescents. Exploring the importance of the context.
	Ree, Eline	Staying at work. The role of expectancies and beliefs in health and workplace interventions.
	Morken, Frøydis	Reading and writing processing in dyslexia
2016	Løvoll, Helga Synnevåg	Inside the outdoor experience. On the distinction between pleasant and interesting feelings and their implication in the motivational process.
H	Hjeltnes, Aslak	Facing social fears: An investigation of mindfulness-based stress reduction for young adults with social anxiety disorder
	Øyeflaten, Irene Larsen	Long-term sick leave and work rehabilitation. Prognostic factors for return to work.
	Henriksen, Roger Ekeberg	Social relationships, stress and infection risk in mother and child
	Johnsen, Iren	«Only a friend» - The bereavement process of young adults who have lost a friend to a traumatic death. A mixed methods study.
	Helle, Siri	Cannabis use in non-affective psychoses: Relationship to age at onset, cognitive functioning and social cognition
	Glambek, Mats	Workplace bullying and expulsion in working life. A representative study addressing prospective associations and explanatory conditions.
	Oanes, Camilla Jensen	Tilbakemelding i terapi. På hvilke måter opplever terapeuter at tilbakemeldingsprosedyrer kan virke inn på terapeutiske praksiser?
	Reknes, Iselin	Exposure to workplace bullying among nurses: Health outcomes and individual coping
	Chimhutu, Victor	Results-Based Financing (RBF) in the health sector of a low-income country. From agenda setting to implementation: The case of Tanzania
	Ness, Ingunn Johanne	The Room of Opportunity. Understanding how knowledge and ideas are constructed in multidisciplinary groups working with developing innovative ideas.
	Hollekim, Ragnhild	Contemporary discourses on children and parenting in Norway. An empirical study based on two cases.
	Doran, Rouven	Eco-friendly travelling: The relevance of perceived norms and social comparison
2017	Katisi, Masego	The power of context in health partnerships: Exploring synergy and antagonism between external and internal ideologies in implementing Safe Male Circumcision (SMC) for HIV prevention in Botswana
V		

	Jamaludin, Nor Lelawati Binti	The “why” and “how” of International Students’ Ambassadorship Roles in International Education
	Berthelsen, Mona	Effects of shift work and psychological and social work factors on mental distress. Studies of onshore/offshore workers and nurses in Norway.
	Krane, Vibeke	Lærer-elev-relasjoner, elevers psykiske helse og frafall i videregående skole – en eksplorerende studie om samarbeid og den store betydningen av de små ting
	Søvik, Margaret Ljosnes	Evaluating the implementation of the Empowering Coaching™ program in Norway
	Tonheim, Milfrid	A troublesome transition: Social reintegration of girl soldiers returning ‘home’
	Senneseth, Mette	Improving social network support for partners facing spousal cancer while caring for minors. A randomized controlled trial.
	Urke, Helga Bjørnøy	Child health and child care of very young children in Bolivia, Colombia and Peru.
	Bakhturidze, George	Public Participation in Tobacco Control Policy-making in Georgia
	Fismen, Anne-Siri	Adolescent eating habits. Trends and socio-economic status.
2017 H	Hagatun, Susanne	Internet-based cognitive-behavioural therapy for insomnia. A randomised controlled trial in Norway.
	Eichele, Heike	Electrophysiological Correlates of Performance Monitoring in Children with Tourette Syndrome. A developmental perspective.
	Risan, Ulf Patrick	Accommodating trauma in police interviews. An exploration of rapport in investigative interviews of traumatized victims.
	Sandhåland, Hilde	Safety on board offshore vessels: A study of shipboard factors and situation awareness
	Blågestad, Tone Fidje	Less pain – better sleep and mood? Interrelatedness of pain, sleep and mood in total hip arthroplasty patients
	Kronstad, Morten	Frå skulebenk til deadlines. Korleis nettjournalistar og journaliststudentar lærer, og korleis dei utviklar journalistfagleg kunnskap
	Vedaa, Øystein	Shift work: The importance of sufficient time for rest between shifts.
	Steine, Iris Mulders	Predictors of symptoms outcomes among adult survivors of sexual abuse: The role of abuse characteristics, cumulative childhood maltreatment, genetic variants, and perceived social support.
	Høgheim, Sigve	Making math interesting: An experimental study of interventions to encourage interest in mathematics

2018 V	Brevik, Erlend Joramo	Adult Attention Deficit Hyperactivity Disorder. Beyond the Core Symptoms of the Diagnostic and Statistical Manual of Mental Disorders.
	Erevik, Eilin Kristine	User-generated alcohol-related content on social media: Determinants and relation to offline alcohol use
	Hagen, Egon	Cognitive and psychological functioning in patients with substance use disorder; from initial assessment to one-year recovery
	Adólfssdóttir, Steinunn	Subcomponents of executive functions: Effects of age and brain maturations
	Brattabø, Ingfrid Vaksdal	Detection of child maltreatment, the role of dental health personnel – A national cross-sectional study among public dental health personnel in Norway
	Fylkesnes, Marte Knag	Frykt, forhandlinger og deltakelse. Ungdommer og foreldre med etnisk minoritetsbakgrunn i møte med den norske barnevernstjenesten.
	Stiegler, Jan Reidar	Processing emotions in emotion-focused therapy. Exploring the impact of the two-chair dialogue intervention.
	Egelandsdal, Kjetil	Clickers and Formative Feedback at University Lectures. Exploring students and teachers' reception and use of feedback from clicker interventions.
	Torjussen, Lars Petter Storm	Foreningen av visdom og veltalenhet – utkast til en universitetsdidaktikk gjennom en kritikk og videreføring av Skjervheims pedagogiske filosofi på bakgrunn av Arendt og Foucault. <i>Eller hvorfor menneskelivet er mer som å spille fløyte enn å bygge et hus.</i>
Selvik, Sabreen	A childhood at refuges. Children with multiple relocations at refuges for abused women.	
2018 H	Leino, Tony Mathias	Structural game characteristics, game features, financial outcomes and gambling behaviour
	Raknes, Solfrid	Anxious Adolescents: Prevalence, Correlates, and Preventive Cognitive Behavioural Interventions
	Morken, Katharina Teresa Enehaug	Mentalization-based treatment of female patients with severe personality disorder and substance use disorder
	Braatveit, Kirsten Johanne	Intellectual disability among in-patients with substance use disorders
	Barua, Padmaja	Unequal Interdependencies: Exploring Power and Agency in Domestic Work Relations in Contemporary India
	Darkwah, Ernest	Caring for "parentless" children. An exploration of work-related experiences of caregivers in children's homes in Ghana.
	Valdersnes, Kjersti Bergheim	Safety Climate perceptions in High Reliability Organizations – the role of Psychological Capital

2019 V	Kongsgården, Petter	Vurderingspraksiser i teknologirike læringsmiljøer. En undersøkelse av læreres vurderingspraksiser i teknologirike læringsmiljøer og implikasjoner på elevenes medvirkning i egen læringsprosess.
	Vikene, Kjetil	Complexity in Rhythm and Parkinson's disease: Cognitive and Neuronal Correlates
	Heradstveit, Ove	Alcohol- and drug use among adolescents. School-related problems, childhood mental health problems, and psychiatric diagnoses.
	Riise, Eili Nygard	Concentrated exposure and response prevention for obsessive-compulsive disorder in adolescents: the Bergen 4-day treatment
	Vik, Alexandra	Imaging the Aging Brain: From Morphometry to Functional Connectivity
	Krossbakken, Elfrid	Personal and Contextual Factors Influencing Gaming Behaviour. Risk Factors and Prevention of Video Game Addiction.
	Solholm, Roar	Foreldrenes status og rolle i familie- og nærmiljøbaserte intervensjoner for barn med atferdsvansker
	Baldomir, Andrea Margarita	Children at Risk and Mothering Networks in Buenos Aires, Argentina: Analyses of Socialization and Law-Abiding Practices in Public Early Childhood Intervention.
	Samuelsson, Martin Per	Education for Deliberative Democracy. Theoretical assumptions and classroom practices.
Visted, Endre	Emotion regulation difficulties. The role in onset, maintenance and recurrence of major depressive disorder.	
2019 H	Nordmo, Morten	Sleep and naval performance. The impact of personality and leadership.
	Sveinsdóttir, Vigdis	Supported Employment and preventing Early Disability (SEED)
	Dwyer, Gerard Eric	New approaches to the use of magnetic resonance spectroscopy for investigating the pathophysiology of auditory-verbal hallucinations
	Synnevåg, Ellen Strøm	Planning for Public Health. Balancing top-down and bottom-up approaches in Norwegian municipalities.
	Kvinge, Øystein Røsseland	Presentation in teacher education. A study of student teachers' transformation and representation of subject content using semiotic technology.
	Thorsen, Anders Lillevik	The emotional brain in obsessive-compulsive disorder
	Eldal, Kari	Sikkerhetsnett som tek imot om eg fell – men som også kan fange meg. Korleis erfarer menneske med psykiske lidningar ei innlegging i psykisk helsevern? Eit samarbeidsbasert forskingsprosjekt mellom forskarar og brukarar.

	Svendsen, Julie Lillebostad	Self-compassion - Relationship with mindfulness, emotional stress symptoms and psychophysiological flexibility
2020 V	Albæk, Ane Ugland	Walking children through a minefield. Qualitative studies of professionals' experiences addressing abuse in child interviews.
	Ludvigsen, Kristine	Creating Spaces for Formative Feedback in Lectures. Understanding how use of educational technology can support formative assessment in lectures in higher education.
	Hansen, Hege	Tidlig intervensjon og recoveryprosesser ved førsteepisode psykose. En kvalitativ utforskning av ulike perspektiver.
	Nilsen, Sondre Aasen	After the Divorce: Academic Achievement, Mental Health, and Health Complaints in Adolescence. Heterogeneous associations by parental education, family structure, and siblings.
	Hovland, Runar Tengel	Kliniske tilbakemeldingssystemer i psykisk helsevern – implementering og praktisering
	Sæverot, Ane Malene	Bilde og pedagogikk. En empirisk undersøkelse av ungdoms fortellinger om bilder.
	Carlsen, Siv-Elin Leirvåg	Opioid maintenance treatment and social aspects of quality of life for first-time enrolled patients. A quantitative study.
	Haugen, Lill Susann Ynnesdal	Meeting places in Norwegian community mental health care: A participatory and community psychological inquiry
2020 H	Markova, Valeria	How do immigrants in Norway interpret, view, and prefer to cope with symptoms of depression? A mixed method study
	Anda-Ågotnes, Liss Gøril	Cognitive change in psychosis
	Finserås, Turi Reiten	Assessment, reward characteristics and parental mediation of Internet Gaming Disorder
	Hagen, Susanne	«Helse i alt kommunen gjør? ...» - en undersøkelse av samvariasjoner mellom kommunale faktorer og norske kommuners bruk av folkehelsekoordinator, fokus på levekår og prioritering av fordelingshensyn blant sosioøkonomiske grupper.
	Rajalingam, Dhaksshaginy	The impact of workplace bullying and repeated social defeat on health complaints and behavioral outcomes: A biopsychosocial perspective
	Potrebny, Thomas	Temporal trends in psychological distress and healthcare utilization among young people
2021 V	Hjetland, Gunnhild Johnsen	The effect of bright light on sleep in nursing home patients with dementia
	Marquardt, Lynn Anne	tDCS as treatment in neuro-psychiatric disorders. The underlying neuronal mechanisms of tDCS treatment of auditory verbal hallucinations.

Sunde, Erlend	Effects of light interventions for adaptation to night work: Simulated night work experiments	
Kusztrits, Isabella	About psychotic-like experiences and auditory verbal hallucinations. Transdiagnostic investigations of neurobiological, cognitive, and emotional aspects of a continuous phenomenon.	
Halvorsen, Øyvind Wiik	Aktørskap hjå norsklærarar i vidaregåande skule – Ein sosiokulturell intervjustudie	
Fyhn, Tonje	Barriers and facilitators to increasing work participation among people with moderate to severe mental illness	
Marti, Andrea Rørvik	Shift work, circadian rhythms, and the brain. Identifying biological mechanisms underlying the metabolic and cognitive consequences of work timing, using a rat model.	
Thomassen, Ådne Gabriel	Hardiness and mental health in military organizations. Exploring mechanism and boundary conditions.	
Husabø, Elisabeth Bakke	Implementation of indicated anxiety prevention in schools	
Hagatun, Kari	The Educational Situation for Roma Pupils in Norway. Silenced Narratives on Schooling and Future.	
Herrero-Arias, Raquel	Negotiating parenting culture, identity, and belonging. The experiences of Southern European parents raising their children in Norway.	
Moltudal, Synnøve	Purposeful Actions in Leadership of Learning Processes: A Mixed Methods Study of Classroom Management in Digital Learning Environments	
2021 H	Johnsen, Anja	Barn og unge i fattige familier: Selvpoppfattet skolekompetanse, etnisitet og akademisk resiliens. Hvilke faktorer kan fremme skoleprestasjoner hos barn og unge i risiko?
Eilertsen, Silje Elisabeth Hasmo	Who profits from concentrated exposure treatment for obsessive-compulsive disorder (OCD)? A quality assurance project from the OCD-team in Bergen.	
Chegeni, Razieh	Anabolic-Androgenic Steroids and Aggression in Humans: Experimental Studies, Subgroups, and Longitudinal Risk	
Solstad, Stig Magne	Patients' experiences with routine outcome monitoring and clinical feedback systems in psychotherapy	
Oldeide, Olin Blaalid	Local drug prevention - From policy to practice: A qualitative case study of policy makers, outreach social workers and at-risk youths	
Steinkopf, Per Heine	«Being the Instrument of Change» Staff Experiences in Developing Trauma-informed Practice in a Norwegian Child Welfare Residential Care Unit.	
Tsogli, Barbara	When predictions about the “what”, “where” and “when” interact with statistical learning, from a behavioural and neural perspective.	

2022 V	Simhan, Indra Laetitia	Seeing and being seen: An investigation of video guidance processes with vulnerable parents of infants
	Fekete, Orsolya Réka	Clubhouse Members' Experiences of Being in Recovery in Light of Salutogenesis
	Madsø, Kristine Gustavsen	Momentary well-being in dementia: Observational assessment of psychosocial interventions and music therapy
	Olaniyan, Oyeniyi Samuel	Embracing both sides of the same coin. Work-related psychosocial risks and resources among child welfare workers.
	Harris, Samantha Marie	Mental health encounters between general practitioners and individuals with a refugee background - Help seeking and provision in the resettlement context
	Larsen, Marit Hjellset	Service support and quality of life for youth in foster care
	Vik, Berit Marie Dykesteen dr.philos.	Effects of Music Training on Cortical Plasticity: Cognitive Rehabilitation of Patients with Traumatic Brain Injury
	Abamosa, Juhar Yasin	Pathways to Social Inclusion: The Role of Institutions in the Social Inclusion of Refugees into Higher Education in Norway. Policies and practices in focus.
	Raudeberg, Rune	Improving the Methodology for Assessing Cognitive Impairment in People with Schizophrenia Spectrum Disorders
	Ågotnes, Kari Wik	Work-related risk factors for workplace bullying. The moderating effect of laissez-faire leadership.
	Stokkebekk, Jan Kristian	Navigating Prolonged Conflict: Subject positions and meaning constructions in postdivorce families
	Valle, Roald	Skoleledelse og utdanningspolitikk. Hvordan beskrives skoleledelse etter 1990?
	Woodfin, Vivian Irena	Self-Compassion and Perfectionism
	Aarestad, Sarah Helene	Treating the aftermath of exposure to workplace bullying and preventing exclusion from working life. The effect of individual resilience, return to work self-efficacy and work-focused metacognitive and cognitive treatment.
Ampim, Gloria Abena	Transforming gender relations? Men's involvement in care for their partners and households at the time of pregnancy in rural and urban Ghana – A qualitative study	
2022 H	Liset, Randi	Light exposure and stress in pregnancy: Effects of blue-blocking glasses on sleep, mood and melatonin



Graphic design: Communication Division, UIB / Print: Skjipes Kommunikasjon AS



uib.no

ISBN: 9788230845035 (print)
9788230863787 (PDF)