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Lee, Katharine

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Adolescents' Representations of Climate Change

Katharine Lee

A thesis submitted for the degree of Doctor of Philosophy

University of Bath, Department of Psychology

December 2020

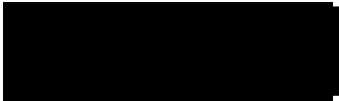
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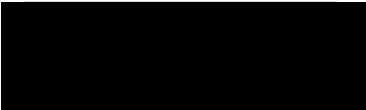
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Table of Contents

Title page	1
Copyright Notice	2
Declaration of Authorship.....	3
Table of Contents	4
List of Tables	9
List of Figures.....	10
Acknowledgements	11
Abstract.....	12
List of Abbreviations	14
1 Introduction	15
1.1 The problem of climate change	15
1.2 The ‘super wicked’ problem of climate change	16
1.3 Youth responses to climate change.....	17
1.4 What do adolescents think about climate change? What do we need to know about what they think?	19
1.5 Social Representation Theory	20
1.6 Why is SRT relevant to exploring how adolescents understand climate change?.....	21
1.6.1 An SRT rather than individual risk perception approach to adolescents’ understanding of climate change	21
1.6.2 An SRT rather than developmental psychology approach to adolescents’ understandings of climate change.....	23
1.7 Adults’ Understandings of Climate Change: Some Findings from Qualitative Studies	25
1.8 Aim and Research Question	25

1.9	Chapter Overview	26
2	Methodology.....	35
2.1	Logic of Inquiry.....	35
2.2	Ontological and epistemological assumptions	35
2.2.1	Ontological assumptions	35
2.2.2	Epistemological assumptions.....	36
2.3	A Qualitative Methodological Approach.....	36
2.3.1	The right approach to answer the research aim	37
2.3.2	An approach that ‘fits’ Social Representation Theory (SRT) and a constructionist epistemology.....	37
2.3.3	An approach that gives voice to adolescent participants	38
2.4	Criticisms of a qualitative methodological approach	38
2.4.1	Qualitative research is not ‘scientific’.....	39
2.4.2	Other criticisms of qualitative research	39
2.4.3	Assessing the quality of qualitative research	40
2.5	Individual methods employed in the empirical studies	41
2.6	Ethical considerations	42
2.7	Reflexive commentary	43
	Statement of Authorship.....	48
3	Youth perceptions of climate change: A narrative synthesis.....	49
	Linking Text	74
	Statement of Authorship.....	75
4	Adolescents' Social Representations of Climate Change: A free association study.....	76
4.1	Introduction	77
4.2	Method	80
4.2.1	Design	80
4.2.2	Participants.....	80
4.2.3	Materials	81
4.2.4	Procedure	81
4.2.5	Analysis.....	81

4.3	Results.....	82
4.3.1	Category descriptions and frequencies.....	82
4.3.2	Within category analysis	85
4.3.3	Relationship between image categories	86
4.4	Discussion	87
4.4.1	Images of climate change	88
4.4.2	Content of image categories.....	88
4.4.3	Relationship between image categories	89
4.4.4	Processes of representations	89
4.4.5	Structure of representations.....	90
4.4.6	Psychological distance	90
4.4.7	Comparing findings with literature relating to young people and climate change	91
4.4.8	Comparing findings with adult climate change literature.....	91
4.4.9	Strengths, limitations and future directions	92
4.5	Conclusion	93
	Linking Text	99
5	‘Will polar bears melt?’ A qualitative analysis of children’s questions about climate change	101
5.1	Introduction	102
5.2	Method	104
5.2.1	Design.....	104
5.2.2	Procedure	104
5.2.3	Participants	105
5.2.4	Analysis	105
5.3	Results.....	106
5.3.1	The nature of climate change	106
5.3.2	The causes of climate change	107
5.3.3	The current impacts of climate change	108
5.3.4	The future impacts of climate change	108
5.3.5	Resolving climate change	109
5.3.6	The reality / severity of climate change.....	110
5.4	Discussion	111
5.4.1	What questions were asked?.....	111
5.4.2	Is climate change viewed as psychologically distant?	112
5.4.3	Strengths, limitations and future research.....	113
5.4.4	Implications	114
	Linking Text	119

Statement of Authorship.....	120
6 Adolescents’ representations of climate change: exploring the self-other thema in a focus group study	121
6.1 Introduction	122
6.1.1 Social representations and climate change.....	122
6.1.2 The present study.....	124
6.2 Method	124
6.2.1 Design	124
6.2.2 Procedure	124
6.2.3 Participants.....	125
6.2.4 Analysis.....	125
6.3 Results	125
6.3.1 The variable other causes climate change.....	126
6.3.2 Protecting the self from the impacts of climate change.....	128
6.3.3 The complex self, the simple other: solutions to climate change	131
6.4 Discussion.....	135
6.4.1 The variable ‘other’ causes climate change.....	136
6.4.2 Protecting the self from the impacts of climate change.....	136
6.4.3 The complex self, the simple other: solutions to climate change	137
6.4.4 Reflections on conducting focus groups	138
6.4.5 Implications for future research, policy and practice.....	138
6.5 Conclusion.....	139
Linking Text	144
Statement of Authorship.....	145
7 Adolescents’ perspectives on the youth climate strikes: An interview study with strikers and non-strikers	146
7.1 Introduction	147
7.2 Method	149
7.2.1 Design	149
7.2.2 Procedure.....	150
7.2.3 Participants.....	150
7.2.4 Analysis.....	151
7.3 Results	151
7.3.1 Areas of consensus.....	152
7.3.2 Areas of divergence	156

7.3.3	Strikers	159
7.4	Discussion	161
7.4.1	Strengths, limitations, and future research.....	162
7.4.2	Wider implications	163
8	Discussion and Conclusions	169
8.1	Research aim and summary of findings.....	169
8.2	How do adolescents represent climate change?	171
8.2.1	What types of social representations are they sharing?	171
8.2.2	Functional Social Representations: Climate Change and Psychological Distance 172	
8.2.3	Processes of Social Representation: Anchoring and Objectification	174
8.2.4	Social Representations of Climate Change: Implications for Action.....	175
8.2.5	Age-related Differences in Social Representations of Climate Change	176
8.3	Summary of the Theoretical Contribution of the Thesis	176
8.4	Methodological insights	177
8.5	Limitations	178
8.5.1	Sampling limitations	178
8.5.2	Methodological limitations	179
8.6	Future Research.....	179
8.7	Implications for Policy and Practice.....	180
8.7.1	Climate change and the curricula: earlier teaching and teaching across subjects 180	
8.7.2	Political action on climate change: now not later	181
8.7.3	Political representation: votes at 16?	182
8.8	Conclusion	183
	Appendix A: Ethical Approvals	190
	Appendix B: Materials Study 1	191
	Appendix C: Materials Study 3	194
	Appendix D: Materials Study 4.....	197

List of Tables

Chapter 3

Table 1. Inclusion and exclusion criteria

Table 2. Country of origin of reviewed studies split by income status

Table 3. Exemplar terms used in reviewed studies

Chapter 4

Table 1. Breakdown of participants by age and gender

Table 2. Identified categories

Chapter 6

Table 1. Summary of participants – Sex, Year group (Age)

Chapter 7

Table 1. Summary of participants – Pseudonym, Sex, Age, Striker status

List of Figures

Chapter 3

Figure 1. Result of search and quality control process

Figure 2. Number of reviewed studies per year

Chapter 4

Figure 1. First response and all response categories – year groups 7/8 %

Figure 2. First response and all response categories – year groups 9/10 %

Figure 3. MDS plot for year groups 7/8

Figure 4. MDS plot for year groups 9/10

Chapter 5

Figure 1. Number of questions in each category

Chapter 7

Figure 1. Striker status, topics of consensus and divergence

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Abstract

Adolescents will face the serious future challenges associated with climate change, yet – compared to adults – there is relatively little research investigating their understandings of climate change. Much of the existing research is concerned with the accuracy of their knowledge or their stated support for particular actions to mitigate climate change. The focus of inquiry is typically prescribed, and the dominant use of quantitative methods means that response options are pre-specified. The aim of this thesis was to elicit and examine the ways adolescents understand and make meaning of climate change, and how and where they position it in relation to their own and others' lives. Four empirical qualitative studies were conducted to explore this focus, with Social Representation Theory used as lens through which to consider the research findings.

The participants in these studies represented climate change as a real and anthropogenic phenomenon with potentially devastating consequences for the Earth and its inhabitants. Participants positioned others as more responsible for causing climate change. The more serious consequences of climate change were often – but not always – placed with others or at a distance, with some participants associating climate change consequences – and solutions – with science-fiction-like concepts. Participants argued that government-led political, economic, and social change is required to resolve climate change. They also expressed considerable anger at the intergenerational injustice of climate change and the lack of action being taken. However, although united on the issue of intergenerational injustice and the need for action on climate change, not all participants were fully supportive of the youth climate movement and its adherents.

Whilst their representations of climate change mirror adults' in many ways, the issue of intergenerational injustice features prominently in these adolescents'

representations. The findings indicate the potential utility of earlier and broader climate change education and of expanding political participation to include older adolescents.

List of Abbreviations

BPS	British Psychological Society
CO ₂	Carbon Dioxide
COP(e.g., 21)	Conference of Parties (to the United Nations Framework Convention on Climate Change)
GHG	Greenhouse Gas
IPCC	Intergovernmental Panel on Climate Change
SRT	Social Representation Theory
UK	United Kingdom
UN	United Nations
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNFCCC	United Nations Framework Convention on Climate Change
USA	United States of America
WHO	World Health Organisation

1 Introduction

The aim of this thesis is to capture, describe, analyse, and understand adolescents' representations of climate change. In this opening chapter, the rationale for addressing this issue is provided. First, the problem of climate change is outlined, and its environmental and socio-political and environmental significance globally and in the UK explained. The reasons for conducting research with adolescents about this issue are then detailed. The theoretical framework being applied is explicated and the research aim outlined. A brief summary of the following thesis chapters is provided.

1.1 The problem of climate change

The United Nations (2020) calls climate change the defining issue of the age, and one with wide-ranging impacts on the planet and its occupants. Climate change refers to identifiable changes in temperatures and weather patterns over time, both locally and globally (IPCC 2018). The United Nations Framework Convention on Climate Change defines climate change as a change of climate attributable to human activity over and above any natural variation (UNFCCC, 1992). Although climate change can be caused by both natural processes, such as volcanic eruptions, and anthropogenic processes, such as industrialisation and population growth, scientists have long argued that post-industrial warming is above the level of natural variability (Crowley, 2000). Global temperatures and cumulative levels of greenhouse gases (GHG) – particularly carbon dioxide (CO₂) – in the atmosphere have both risen steadily since the industrial revolution, and modelling demonstrates that post-industrial warming is unequivocally anthropogenic (e.g., Neukom, Steiger, Gómez-Navarro, Wang, & Werner, 2019).

The average global temperature is now around 1°C higher than in pre-industrial times and is predicted to rise to 1.5°C higher between 2030 and 2052 if warming continues to increase at the current rate (IPCC, 2018). Impacts of climate change such as rising sea levels, melting ice, and changing weather patterns are already being observed (Sippel, Meinshausen, Fischer, Székely, & Knutti, 2020; VijayaVenkataRaman, Iniyar, & Goic, 2012), and the risks associated with a 1.5°C rise would be substantially more severe than those currently occurring (IPCC, 2018). Following the Paris Agreement in 2015, where parties agreed to limit warming to 2°C and pursue efforts to limit to 1.5°C, an IPCC special report outlined the differences of impacts arising at a 1.5°C increase compared to 2°C. It highlighted the more extreme risks of increasing temperatures, sea level rise, precipitation, and biodiversity loss, and the consequent impacts on human health

and wellbeing that would occur at 2°C warming (IPCC, 2018). The national mitigation ambitions stated in The Paris Agreement (2015) for 2030 would not be sufficient to meet the 1.5°C limit. To limit warming to 1.5°C, further commitments must be made to reduce global CO₂ emissions before 2030. Alongside increasing mitigation efforts, strengthening adaptation capability is needed to manage vulnerability to and reduce potential risks from climate change impacts (IPCC, 2018; Larsen & Gunnarsson-Östling, 2009).

The UK is a high ranking all-time contributor to climate change and has made the highest per capita contribution of all countries (Matthews et al., 2014). Along with other developed nations such as USA, Australia, Canada, and other European countries, it is classified a 'free rider' nation because its contribution to climate change outweighs its vulnerability to its impacts (Althor, Watson, & Fuller, 2016). Nonetheless, impacts of climate change are being felt in the UK (UKCP, 2019). Average temperatures have increased about 1°C over the last century with a trend to warmer winters and hotter summers and sea levels are rising about 3mm a year. There is growing evidence of a change in rainfall pattern, although this cannot yet be definitively attributed to climate change. Looking forward, a combination of sea level rise and increasing rainfall will likely cause more flood risks. Increasing temperatures could impact water supplies, food supplies, and human health and wellbeing (Committee on Climate Change, 2017).

Recent UK governments have taken a relatively progressive high-level approach to climate change, but individual policy debates and decisions have not always been in step with the overarching approach. In 2008, the UK parliament agreed the Climate Change Act (UK Government, 2008), the first legally binding national legislation to limit GHG emissions. The Act outlined an ambitious framework for the UK to reduce GHG emissions to 80% of 1990 levels by 2050 and saw the creation of an independent Committee on Climate Change to advise the government on policy. The Act might not have passed but for then leader of the opposition David Cameron seeking to reframe the Conservatives as a 'green' party in order to appeal to younger voters (Carter, 2014). Since the Act was passed and Cameron became Prime Minister, his government introduced policies at cross purposes with the legislation, such as subsidies for oil and gas (Carrington, 2015). Political debates pitting economic benefit against environmental protection, such as airport expansion at a number of locations – which would be incompatible with the UK's target on carbon emissions if unrestricted (Finney & Mattioli, 2019) – have persisted. Then in 2019, the UK became the first major economy to pass a net zero emissions law, setting a new, more ambitious target to bring all GHG emissions to net zero rather than the previous target of an 80% reduction by 2050 (UK Government, 2019).

1.2 The 'super wicked' problem of climate change

Climate change is a ‘wicked problem’ (Rittel & Webber, 1973); a problem that is inherently difficult to resolve due to there being no universally-accepted (or acceptable) and definitive solution. It is called a ‘super wicked problem’ (Lazarus, 2008; Levin, Cashore, Bernstein, & Auld, 2012) for four additional reasons. First, time is running out. Second, those with a greater share in causing climate change are typically less motivated to resolve it. Third, there is no single global authority for what is a global problem, and fourth, policy responses tend to favour the present over the future (Thompson, 2010). These four points remain relevant in the current context. First, the scientific consensus about the urgent need to address climate change has likely hardened since 2010 (e.g., Oreskes, 2018). Second, the countries currently deemed 1.5°C or 2°C compatible are all low (2), lower-middle (5) or upper-middle (1) income countries (World Bank, 2021); high income countries’ performances are currently ranked insufficient (e.g., UK), highly insufficient (e.g., Japan), or critically insufficient (e.g., USA) (Climate Action Tracker, 2021). Third, that so many high-income countries are not close to being on track to meet commitments agreed to in Paris indicates that there remains no single global authority. Finally, it is difficult to determine the extent to which policy responses favour the present over the future given there is no absolute agreement about the extent to which current policy can and should consider the future (e.g., Diaz & Moore, 2017). The wickedness of the problem is exacerbated because it is characterised by power asymmetry (Gardiner, 2011), resulting in comparative ‘winners’ and ‘losers’. Rich nations have a greater ability than poorer nations to shape responses to climate change. Vulnerability to climate change impacts is not evenly distributed across the globe and does not necessarily correspond to either cumulative or current GHG emissions. Many developing countries produce low emissions but are more vulnerable to the impacts of climate change than many developed and high-emitting countries, who are less vulnerable (Althor et al., 2016). Similarly, earlier generations can shape the future of younger and future generations but not vice versa, and climate change will have a disproportionately negative impact on young people and future generations if attempts to limit climate change fail (Lewis, 2018). Hansen et al. (2013) observed that failing to limit climate change would constitute “an act of extraordinary witting intergenerational injustice” (p. 1). This injustice is compounded by adolescents’ lack of access to representation in politics and to the policy making that will shape their future (Graham & De Bell, 2020).

1.3 Youth responses to climate change

Recognising that climate change is a human rights and social justice issue as well as an environmental issue (Levy & Patz, 2015), a youth movement began in 2015, with 50,000 people taking part in a global strike, to coincide with the COP21 in Paris. Following this, then 15-year old Swedish teenager Greta Thunberg began a solitary protest, skipping school to sit outside the Swedish parliament to demand they take action on climate change (Gould, 2019). A worldwide strike in March 2019 attracted 1.6 million strikers (Wahlström et al., 2019). In September 2019, an

estimated 6 million took part in another global strike (Taylor, Watts, & Bartlett, 2019). Although the emergence of Covid-19 in early 2020 put paid to physical striking for a time, protests continued online (Fridays for Future, 2020).

Like their peers across the globe, many adolescents in the UK have skipped school to take part in one of the monthly climate strikes; an estimated 350,000 school pupils and adults from across the UK took part in a strike on 20th September 2019 (UK Student Climate Network, 2020). This UK network make four demands: that the government declare a climate emergency and implement a 'Green New Deal'; the education system be reformed to teach young people more about climate change; the government better communicate the severity of the climate crisis; and that young people be more included in democratic participation. They argue that to facilitate greater representation, the voting age should be lowered from 18 to 16 and the voting system changed from first past the post to proportional representation (UK Student Climate Network, 2020). In relation to the second demand, the UK has not, like some other countries made climate change a core element of the curriculum (Graham-McLay, 2020). It is part of the Geography and Science curricula at key stage 4 and so may be formally taught from year 8 onwards (from age 13). The most recent Labour party manifesto argued the case for making climate change a core part of the curriculum (The Labour Party, 2019). Changes to the curricula have also been backed by educational psychologists (BPS, 2020) and teachers (Taylor, 2019). A university and college student-led report for UNESCO stressed the urgency of developing forward-looking educational programs that adequately prepare young people for the challenges ahead and develop their critical and whole-systems thinking skills (UNESCO, 2020).

Due to their recency, there has been limited opportunity to understand whether and how the climate strikes have influenced or changed how climate change is viewed by adolescents in the UK. However, the youth strikes and the Extinction Rebellion protests have seemingly had some political impact, as in May 2019 the UK government became the first national government to declare a 'climate emergency' (Turney, 2019), although the declaration is not legally binding (Open Access Government, 2019). Concern about climate change has increased amongst adults in the UK compared to previous years, although is still lower than in some other European countries (Eurobarometer, 2019). In 2020, a UK citizens' assembly report on the UK meeting its emissions commitment detailed support for reaching net zero and for a wide range of actions relating to issues such as transport, meat reduction, and electricity generation (Climate Assembly UK, 2020). The sample was representative of the UK population and the scope and scale of their proposals might signal a shift in public support for more radical action on climate change. The release of the IPCC report outlining the urgency of acting on climate change with a specific temporal marker '12 years' (IPCC, 2018) and the commencement of the youth strikes could have contributed to this. Certainly, there has been a shift in some UK media outlets to using terminology that better reflects the scale of the problem (e.g., Carrington, 2019).

1.4 What do adolescents think about climate change? What do we need to know about what they think?

Some of the academic literature relating to UK youth perceptions of climate change is concerned with young adults rather than adolescents (e.g., Hibberd & Nguyen, 2013). This may be due to the difficulties entailed in conducting research with minors, such as obtaining parental consent (Fisher, 2019). However, it is perhaps surprising, given that adolescents will be more exposed than older generations to the future impacts of climate change (e.g., Tanner, 2010), that there is relatively little research focusing on this group exclusively. A systematic review of international literature relating to 8 to 19-year olds' perceptions of climate change – including some UK studies – is presented in Chapter 3. The review demonstrates that a high proportion of studies take a quantitative, cross-sectional survey approach, examining the accuracy of scientific knowledge about climate change, or measuring willingness to engage in climate-friendly behaviours. It suggests that adolescents in the UK are less concerned about climate change and less willing to engage in climate-friendly behaviours than their peers in countries such as India or Singapore (Lee, Gjersoe, O'Neill, & Barnett, 2020). Few studies examine UK adolescents' understandings of climate change beyond the parameters of scientifically accurate knowledge or acceptability of certain actions.

Here, the focus is solely adolescence, defined as a period of life between childhood and adulthood spanning the age range 10 to 19 (WHO, 2020). The aim of this research is to gain deeper knowledge about how adolescents understand climate change on their own terms, rather than assessing the extent to which their thinking is 'right'. Why is this necessary? First, because this has rarely been addressed in previous research, so what we know about what adolescents think about climate change is typically limited to the parameters outlined above; how what they know compares to the science and which of a range of pre-specified actions they are reportedly willing to take. This stymies the possibility of knowing about broader aspects of how adolescents are thinking about climate change, such as how they conceptualise it when they are not prompted to consider specific issues and where they situate it in relation to their own lives and the lives of others. The way that they do this has obvious implications for their individual practices and their wider engagement with climate change. Giving consideration to what they themselves want to know alongside appraising them of the growing scientific evidence base could also inform what could helpfully be conveyed in educational settings.

Second, as already discussed, the power asymmetry between adults and children (Gardiner, 2011) exacerbates the wickedness of the problem of climate change. Power asymmetry is also baked into the research process when adults decide where the boundaries of what can be known are drawn. This means that some research

may not represent what adolescents want to know or communicate about climate change, if the subject matter (e.g. solutions to climate change) and the response frames (e.g. a likert scale with options one to five) are already set. Given their likely increased exposure to the future impacts of climate change, there is surely a moral obligation to look for ways to limit this asymmetry and to privilege understanding adolescents' thinking beyond adults' framing as far as is possible. It would be naïve to suggest that power can ever be symmetrical in any research conducted by an adult with adolescents and that is not claimed here. Rather, as far as is possible, the aim is to explore and understand adolescents' representations of climate change for their own sake and to draw out the nuance and complexity they contain. The theoretical approach taken to facilitate this is explained in the next section.

1.5 Social Representation Theory

The theoretical approach underpinning this thesis is Social Representation Theory (SRT) (Moscovici, 1961). SRT understands social psychological phenomena and processes as embedded in time, place, and cultural context (Wagner et al., 1999). It lacks the evaluative element that pervades cognitive risk perception approaches, because it focuses on sense-making in and of itself, rather than the accuracy of that sense-making (Joffe & Bettega, 2003). It is an interpersonal, not intrapersonal theory; social representations exist in and between minds, they are formed in relation to others, they circulate in society (Farr, 1993). Markova (2008) draws a parallel between SRT and Einstein's Theory of Relativity; the focus of both is the space between bodies or particles, rather than single bodies or particles.

SRT examines the way that scientific knowledge becomes lay knowledge, how the abstract and reified becomes the concrete and every day. In his influential work 'Psychanalyse son image et son public', Moscovici (1961) explored the way that different milieu in French society characterised the concept of psychoanalysis. He found that urban-liberals, Catholics, and communists represented psychoanalysis differently, and in sympathy with the cultural boundaries of their own group. Urban-liberals represented psychoanalysis in a more or less unfiltered manner. Catholics assimilated some aspects of psychoanalysis into their representations – those that were in line with religious practices such as confession – but rejected its ideas about sex. Communists' representations aligned psychoanalysis with North American deviancy and rejected it in its entirety. These findings demonstrate the context-dependency of social representations – they reflect what can be accommodated within the specific culture in which they arise – and their multiplicity – a number of potentially discordant representations of the same object may exist. Social representations differ from collective representations (Durkheim, 1974), they are not universally shared.

SRT relates to both the processes through which representations come to pass and the content of representations. Moscovici outlined two processes through which

social representations come into being: anchoring and objectification (Moscovici, 1984). The two processes work in tandem and draw upon shared, culturally available resources. Anchoring involves drawing on knowledge of the past to orient the current object. Climate change has historically been anchored to ozone layer depletion, an existing and familiar ‘environmental’ concept (Jaspal, Nerlich, & Cinnirella, 2013). Objectification involves drawing on resources from the present to concretise the issue. These are often visual resources, but may take the form of symbols or metaphors (Joffe, 2003). Images of a sad-looking or solitary polar bear (Wibeck, 2014), or smokestacks silhouetted against the sky (O’Neill & Smith, 2014) frequently objectify climate change in the media. Moscovici (1988) distinguishes between hegemonic representations, which are widely shared; emancipated representations, which are the property of sub-groups; and polemic representations, which are the product of conflict and struggle in a society. A hegemonic representation of climate change might be that it is a serious problem with a human cause (Höijer, 2011). An emancipated representation is one that might be held by a group particularly at risk of the impacts of climate change (Jaspal et al., 2013). A polemic representation might be that the threat posed by climate change is a confection of scientists. Polemic representations of climate change may gain traction and become hegemonic if, for example, climate change is presented as an issue of debate, with two legitimate ‘sides’ (Jaspal et al., 2013). Previous research has examined adults’ social representations of climate change (e.g., Baquiano & Mendez, 2016; Moloney et al., 2014; Smith & Joffe, 2013), but not to my knowledge, adolescents’.

1.6 Why is SRT relevant to exploring how adolescents understand climate change?

Below, I outline why an SRT approach is more appropriate here than either a focus on risk perception or a developmental psychology approach. The arguments for SRT over each are made separately, although it is noteworthy that the differences between SRT and the two approaches are somewhat parallel: SRT is an explicitly social rather than individualistic theory and SRT is about the content and process of meaning-making rather than whether meanings are as they ‘should be’.

1.6.1 An SRT rather than individual risk perception approach to adolescents’ understanding of climate change

Risk perception approaches to climate change tend to focus on the cognitive processes involved in making sense of risk. These approaches are individualistic, with mind analogous to machine (Joffe, 2003). They are concerned with individual assessments that can be compared with scientific, or ‘correct’ assessments. The ‘deficit model’ (Wynne, 1982) sets the irrational or unknowledgeable lay person against the rational and knowledgeable scientist. This model is underpinned by the assumption that if incorrect beliefs or knowledge can be corrected, then attitudes

and behaviours will change, but this is not necessarily the case. Information alone does not change environmental attitudes or behaviours (Whitmarsh, O'Neill, & Lorenzoni, 2013), because people appraise information according to existing wider beliefs (Corner, Whitmarsh, & Xenias, 2012). These existing wider beliefs do not arise from a simple two-dimensional relationship between individual and object, but in the context of a three-dimensional social existence that includes others, from 'social knowledge' (Sammut, 2015). The function of a social representation is to enable group members to orient an issue and communicate about it (Moscovici, 1961); a social representation is social knowledge.

One critique of SRT is that the relationship between social representation and action is unclear, that social representations may influence action but are not part of it (e.g., Potter & Edwards, 1999). This arises from understanding representations as cognitive phenomena, or property of the individual mind rather than understanding that representations constitute a shared reality (Markova, 2000). This thesis assumes the latter position and follows Wagner (2015), viewing 'people representing social objects in and through action', where action is part of a representation. Representations are active, they serve a function, such as to protect against threat to the self by heightening threat to others (e.g., Joffe & Bettega, 2003), or to maintain social exclusion by depicting particular community members as criminal (Howarth, 2002). Howarth (2006) hyphenates 're-representation', to emphasise that representations are mobile and active, subject to re-interpretation, re-thought, and re-representation (Valsiner, 2003). Social representations of climate change may serve to protect the self by deflecting responsibility and vulnerability to the other, or by questioning whether it is a man-made phenomenon (Smith & Joffe, 2013). Social representations of climate change have implications for action therefore, if for example, climate change is considered to be a threat to others more than the self, people may feel less responsible for resolving it (Smith, O'Connor, & Joffe, 2015).

The ideas circulating in society about climate change then, have the potential to impact climate change transformation. How the problem is situated and viewed has implications for the kinds of solutions that are possible. However, situation and view can be better incorporated if climate change is viewed as an adaptive problem. O'Brien (2018) explains the distinction between a technical and adaptive approach to the problem of climate change. On the face of it, this distinction could be explained in terms of viewing the problem in relative isolation (climate change as a scientific problem) versus placing it in the broader context (climate change as a scientific *and* social, political, and economic problem). Technical problems are addressed with solutions focused on expertise, innovation and management. If climate change is viewed as a technical problem, a solution might involve expanding the production of green energy. Technical problems lead to particular kinds of (beneficial) technical solutions, but viewing climate change as a technical problem can obscure some of the broader social and political issues in which climate change is situated, such as inequity (Brand, 2016). Viewing climate change

as an adaptive challenge results in a different perspective. It recognises the importance of the way that the problem of climate change and solutions to it are viewed by society.

One approach seeking to accommodate both a technical and an adaptive view of climate change is O'Brien (2018's) 'three spheres of transformation'. An heuristic rather than a theory, this depicts three interlinked spheres key to transformation. The practical sphere represents particular actions, interventions, or behaviours that can contribute, such as reducing meat consumption, building wind farms, or creating cycling infrastructure. These transformations are tangible and trackable. The political sphere relates to the political and economic systems that enable or constrain some of the actions in the practical sphere. The political sphere is also a space where norms can be challenged, and alliances formed. The personal sphere relates to individual and shared understandings about the world, how the scope of a problem and solutions to it is defined, what is deemed possible and necessary and who is held responsible (O'Brien, 2018). These individual and shared understandings about the world sound remarkably similar to social representations; shared belief systems containing elements such as attitudes (Fraser, 1994) that are neither static nor fixed (O'Brien, 2018), that can be used to justify particular policies and actions, or to protect or challenge the status quo (Howarth, 2006). An SRT approach facilitates an understanding of adolescents' individual and shared understandings about climate change. The concern is not accuracy of knowledge, but the ways that climate change is situated and understood and the potential implications of these for action.

1.6.2 An SRT rather than developmental psychology approach to adolescents' understandings of climate change

A legitimate perspective to take to investigate adolescents' understandings of climate change would be a developmental one (e.g., Piaget, 1929). A Piagetian model of development views children's mental processes as progressing in stages over time from a completely egocentric to less egocentric state. As they age, a child's mental processes become less tied to themselves and their concrete world and more able to incorporate other perspectives and abstract concepts (Piaget, 1955). Inhelder and Piaget (1958) concluded that understanding about complex concepts and problems develops in adolescence, during the fourth and final 'formal operational stage' of development that begins at around age 12 (Siegler, 1978). This would suggest that the ability to understand the complexities of an issue such as climate change would begin at around this age. However, research has shown that adolescents are capable of holding more 'mature' conceptualisations of complex issues such as socio-economic status (Dickinson, 1990), or hierarchy (Emler, Ohana, & Moscovici, 1987) at an earlier age. Further, whilst developmental psychology typically takes little account of influences outside of individual cognition, research into children's concepts of health and

illness indicates that both developmental age and experience contribute to their understanding of illness (Crisp, Ungerer, & Goodnow, 1996).

It should be noted that some developmental psychology theories are more in sympathy with SRT than a Piagetian approach, which has been employed as the antithetical exemplar of developmental psychology here. Some theories do acknowledge the importance and impact of the social world (such as parents, peers, and the wider cultural norms) on development and consider the way that different contexts can lead to different developmental outcomes. For example, Vygotsky (1978, 1997) argued that social interaction is central to child development and Bronfenbrenner (1977, 1992) considered child development existing within and influenced by multiple levels of a child's surrounding environment. However, whilst these theories understand the social world as important and influential, the unit of analysis remains the individual and the impact of the social world *on* the individual rather than – as in SRT – the meanings and understandings created and shared by individuals in social contexts.

A Piagetian approach is underpinned by two core assumptions. First, that 'experience presents things which are to be understood, in the sense of being correctly interpreted' (Emler, Ohana, & Dickinson, 1990). This seems analogous to a deficit-model approach, in that it is concerned with a (deficient) child's cognitive progression towards a (correct) adult interpretation. However, there is frequently no single correct interpretation for complex problems or phenomena; multiple interpretations exist and few problems have a single answer (Billig, 1996). In contrast, an SRT approach does not seek to measure the 'correctness' of thinking, but to understand how people comprehend an object for its own sake. The second assumption is that children are lone learners who construct knowledge about the world on their own (Emler et al., 1990). The implication of this is that every child makes sense of their world as if they are starting afresh (Emler & Ohana, 1993). However, children do not start from scratch, they are born into a particular setting and context and construct knowledge with others; interpersonal conflict and discussion play a role in conceptual change (e.g., Perret-Clermont, 1980). The way an object is understood is a group enterprise; ideas about problems and solutions already exist in the group's collective memory (Emler et al., 1990). This points to perhaps the key difference between Piaget's approach and SRT; the former is a general theory of knowledge development, whereas the latter proposes that knowledge is socially constructed and sustained in context. Studies investigating representations of issues such as economic inequality (Emler & Dickinson, 1985), social relations (Emler et al., 1990), and Europe (Rutland, 1998) have demonstrated that children represent the same issue differently, according to socio-economic status or country of origin. Rather than reaching the same conclusion about a particular concept at the same developmental stage, they reach one that reflects their own situation and location, suggesting that dominant social myths are shared in different contexts, be they socio-economic groups or countries.

1.7 Adults' Understandings of Climate Change: Some Findings from Qualitative Studies

As outlined, this thesis takes an SRT approach to adolescents' understandings of climate change and – as will be outlined in Chapter 2 – adopts a qualitative research approach. It seems appropriate therefore, to give a brief overview of the findings of qualitative research studies relating to adults' understandings of climate change, in order to be able to compare and contrast the findings of this research with the findings of the empirical studies detailed in this thesis.

Qualitative research into adults' understandings of climate change – from both an SRT and other theoretical perspectives – has indicated that adults view climate change as psychologically distant; a phenomenon that impacts distant peoples, places, and timeframes (Trope & Liberman, 2010). Qualitative research has indicated that people see climate change as a problem for the future more than the present (e.g., Hanson-Easey, Williams, Hansen, Fogarty, & Bi, 2015), that impacts distant locations more severely (e.g., Wibeck, 2014), and as a problem that others bear greater responsibility for causing (e.g., Rätzl & Uzzell, 2009; Smith & Joffe, 2013). Qualitative research studies also evidence some uncertainty about the anthropogenic nature of climate change (e.g., Olausson, 2011); climate change can be viewed as both natural and human-caused (e.g., Asplund, 2016).

Qualitative research provides depth and insight, and highlights the sometimes contradictory ways that people understand an issue such as climate change (Braun & Clarke, 2013). For example, people may feel a strong sense of personal responsibility for resolving climate change yet also express a sense of futility about the utility of their own actions in the face of inertia and inaction from wider publics and governments (Hanson-Easey et al., 2015; Nash et al., 2020). Climate change is often understood in relation to direct experience of local weather (Olausson, 2011), yet perhaps paradoxically, direct experience of extreme events such as flooding does not necessarily lead to increased concern about climate change (Whitmarsh, 2008). Qualitative research also highlights the way that lay understandings of climate change relate to the specific context in which these understandings arise (Bulkeley, 2000); people view climate change through a lens shaped by their broader worldview and ideals (Lorenzoni & Hulme, 2009), and in accordance with their particular set of circumstances and experiences (Asplund, 2016).

1.8 Aim and Research Question

The aim of this thesis is to capture, describe, analyse, and understand adolescents' representations of climate change in a way that seeks to avoid prescribing or constraining their responses. The systematic narrative review (Chapter 3) and the

empirical chapters (Chapters 4 to 7) have specific research questions outlined in each chapter. The overarching research question that the thesis seeks to answer is:

What are adolescents' representations of climate change?

1.9 Chapter Overview

Chapter 2 explicates the methodological approach being followed in the empirical studies. Ontological and epistemological assumptions are outlined, and the methods used for each of the empirical studies explained. Ethical and reflexive commentaries are detailed.

Chapter 3 presents a systematic narrative review conducted to examine the current evidence base about adolescents' perceptions of climate change. The study included 51 studies with participants aged 8 to 19. The majority of studies were quantitative and used closed-form surveys. The review found that scientifically correct knowledge generally increased with age, although some misconceptions were prominent across the age range. Belief in, concern about, and willingness to take action on climate change were lower in countries such as the UK than in many other countries.

Following the finding in Chapter 3 that much of the current research uses quantitative, cross-sectional methods, and focuses on correctness of knowledge, or willingness to act, **Chapter 4** presents a word association study with 384 adolescents aged 11 to 15 (Study 1). The aim here was to elicit spontaneous responses to climate change, without prescribing particular responses. Twenty-three unique image categories were identified, with nearly 90% of elicitations falling into the top 10 categories. The majority of images related to consequences of climate change rather than causes or solutions. Elicitations referring to 'heat', 'ice melting', 'weather', and 'animals' were most common. A number of responses related to some form of 'disaster', with the most dramatic evoking concepts reminiscent of science fiction.

Chapter 5 presents an analysis of questions 10- to 12-year-olds from 14 UK schools asked scientists about climate change in an online 'climate zone' (Study 2). The aim was to examine whether and how their questions indicated that these adolescents viewed climate change as a psychologically distant or proximal phenomenon. Themes related to the nature and reality of climate change, its causes, consequences, and solutions. Participants appeared most concerned about future consequences and solutions to climate change. A number of questions evoked science fiction imagery. The questions indicated that participants position climate change as both a proximal and a distant phenomenon.

Chapter 6 uses the self-other themata framework to explore where 11- to 15-year-olds situate climate change in relation to themselves and to others (Study 3). Five

focus groups were conducted in order to examine areas of consensus and disagreement. What and who constituted the self and the other differed depending on whether participants were talking about causes, consequences, or solutions to climate change. In all cases, the self was presented more positively than the other. A number of others were deemed responsible for causing climate change, with the self almost absent. Climate change was depicted as affecting other people in other places more than the self. When talking about solutions, the other was deemed to be straightforwardly responsible, whereas the actions of the self were more complex and sometimes appeared contradictory.

In the last empirical study, outlined in *Chapter 7*, interviews were conducted with 22 adolescents aged 11 to 17 (Study 4). The aim was to explore their views about the youth climate strikes and their motivations for attending, or not attending strikes. Based on actions around striking, three groups were identified: strikers, would-be strikers, and non-strikers. Then, three areas of consensus and three of divergence were examined. Regardless of actions around striking, participants were united in expressing concern about climate change and its disproportionate impact on their generation, holding the government most responsible for resolving climate change, and valuing the importance of education. Strikers and would-be strikers expressed similar views and non-strikers opposing views relating to Greta Thunberg, the effectiveness of strikes, and the motivations of strikers.

In *Chapter 8*, the findings are synthesised, and key learnings discussed. Strengths and weaknesses are outlined and directions for future research proposed. Finally, implications for policy and practice are proposed.

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2 Methodology

In this section, I explain the adopted research strategy. First, I outline the chosen logic of inquiry and the underpinning ontological and epistemological assumptions. Then, I explicate and justify the qualitative methodological approach, before outlining and justifying the methods employed in each of the research studies. A discussion of the ethical implications of working with young participants and a short reflexive account follow.

2.1 Logic of Inquiry

Of the four logics of inquiry available in the social sciences: inductive, deductive, retroductive, and abductive (Blaikie & Priest, 2019), an abductive approach has been selected here. Abductive logic privileges the meanings and interpretations people make in everyday life. It is a 'bottom up' approach that seeks to understand the 'insider view', rather than impose upon participants an outsider framework or view (Blaikie & Priest, 2019). An abductive approach is most concerned with exploration, description, and understanding (Blaikie & Priest, 2019). An abductive logic of inquiry is appropriate here, because the goal is to explore the shared knowledge, meanings, and intentions that adolescents espouse in relation to climate change and to gain new insights (Stainton Rogers, 2003) into the ways they understand it.

2.2 Ontological and epistemological assumptions

2.2.1 Ontological assumptions

Necessarily, logics of inquiry are underpinned by ontological and epistemological assumptions. Ontology is the branch of philosophy that studies the nature of being, of what constitutes reality (Crotty, 1998). An ontological assumption in research relates to the often-implicit claims being made about the reality of what is studied. According to Blaikie and Priest (2019), there are six types of ontological assumptions: shallow realist, conceptual realist, cautious realist, depth realist, subtle realist, and idealist. The ontological assumption adopted here is subtle realist. This entails acknowledgement of the existence of a reality beyond immediate experience along with acceptance that cultural assumptions mean that reality cannot be understood conclusively and definitively. I also subscribe to the position that climate change is ontologically plural: real and multiple as opposed to real and singular (Esbjörn-Hargens, 2010). Ontologically plural because the position one occupies and the place from which one looks at climate change determines what climate change is conceived to be. An arctic researcher, a political activist, and a PhD student in psychology may be looking at broadly the same

climate change, but not exactly the same climate change. This simply constitutes an acknowledgement that there can be multiple realities rather than a singular reality (Mol, 2002).

2.2.2 Epistemological assumptions

Epistemology is the branch of philosophy concerned with how we can know about the world (Scotland, 2012), with what is knowable and worth knowing. Blaikie and Priest (2019) outline six types of possible epistemological assumptions: empiricism, rationalism, falsificationism, neo-realism, constructionism, and conventionalism. The epistemological position assumed here is constructionism. Within this view, knowledge about the world is not considered the product of the self-contained, autonomous individual, but of the relational, dialogical many (Gergen, 2018). A constructionist view does not propose that all objects are socially constructed, but that our understandings of objects are (Edley, 2001). Historically, critics of constructionism have linked its epistemological assumptions to an idealist or anti-realist ontology and made the ensuing critique that the approach is problematic because it leads to the inevitable conclusion that nothing can ever be really known (Edley, 2001). However, this critique is based on a misunderstanding, because – if they say anything about ontology at all – when constructionists claim there is nothing outside of text or language (e.g., Edwards, 1997), they are making an epistemic, not ontological claim (Edley, 2001).

A constructionist epistemological perspective posits that beliefs about objects such as climate change are created by, for, and between members of a community, they are created in and by society (Berger & Luckmann, 1991). The way climate change is understood then, may not therefore reflect what it ‘really’ is, but rather, how it is represented. Time, place, and cultural context are important, as they influence and are reflected in representations of objects (Burr & Dick, 2017); whilst people across cultures, time, and place might be looking at the same ‘thing’, they may produce very different understandings of it (Liebrucks, 2001). This explains why people in different cultures present subtly or radically different understandings of climate change; it may not mean the same thing to different people in different contexts (e.g., Kvaløy, Finseraas, & Listhaug, 2012; Lorenzoni, Leiserowitz, de Franca Doria, Poortinga, & Pidgeon, 2006).

2.3 A Qualitative Methodological Approach

The methodological approach taken here is qualitative; all of the empirical studies employ qualitative methods. Qualitative research is not a homogenous field, but a heterogenous one containing numerous tensions and differences (Denzin & Lincoln, 2011). However in general, qualitative research is primarily concerned with human meaning from the perspective of participants, with providing an

‘inside’ account of their social realities (Mason, 2017). Three reasons why a qualitative methodological approach has been adopted here are outlined below.

2.3.1 The right approach to answer the research aim

As outlined in Chapter 3 (Lee, Gjersoe, O'Neill, & Barnett, 2020), much of the research investigating adolescents' perceptions or understandings of climate change takes a quantitative research approach. This is a virtue of the types of research questions being asked by these researchers; certain questions can only be answered, or are better answered, with a quantitative research approach. Broadly speaking, quantitative approaches are concerned with numbers, whereas qualitative approaches are concerned with words (Braun & Clarke, 2013). Quantitative researchers are concerned with measurement, whereas qualitative researchers tend to believe that not everything can be measured and are concerned with sense-making (Lamiell, 2018). If the aim of this research was to measure adolescents' concern about climate change or compare levels of willingness to support particular individual actions across an age range, a quantitative approach would be a judicious choice. However, the aim here is to understand the meanings adolescents make of climate change and to elicit – as far as is possible – these meanings without limiting or prescribing their responses. The aim outlined in Chapter 1, focuses on understanding rather than measuring, and calls therefore for a qualitative methodological approach.

2.3.2 An approach that ‘fits’ Social Representation Theory (SRT) and a constructionist epistemology

SRT is broadly aligned with a constructionist epistemology (Lahlou, 2015). Scholars have employed both quantitative (e.g., Dickinson, Robbins, & Fletcher, 2009) and qualitative (e.g., Joffe & Bettega, 2003) methods to explore social representations, although qualitative methods are more appropriate in many cases (Willig & Stainton Rogers, 2017). Moscovici himself was concerned about the plausibility of studying social representations in laboratories (Moscovici & Marková, 1998) and emphasised the importance of observation and of examining conversation in context (Moscovici, 1988). A key concern of both SRT and a qualitative methodological approach is to examine the meanings people make of and their sense-making around particular concepts.

Although qualitative research can be conducted by researchers assuming a variety of epistemological positions (Gergen, 2018), a qualitative methodological approach sits comfortably within a constructionist epistemology. An acceptance that the meanings we make of objects are a product of our social world, situated in time, place, and context, necessitates an approach that specifically seeks to facilitate access to words, to conversation, to sense-making. Qualitative researchers assuming a constructionist epistemology acknowledge that data may not be easily

ordered, may contain what seem to be contradictions, and do not necessarily provide single answers (Braun & Clarke, 2013). However, the approach can facilitate the generation of new insights and understandings and since qualitative research tends to be more naturalistic, it is more attendant to context (Willig, 2013). The aim here is to employ this approach to generate new insights about the meanings adolescents make about climate change.

2.3.3 An approach that gives voice to adolescent participants

Adolescents are somewhat marginalised in climate change research. This may be due in part to the ethical ramifications of conducting research with minors; access and consent are managed by gatekeepers such as parents or schools, so recruitment can be challenging (Fisher, 2019). This has meant that the voices of those with a greater share in the future burden of climate change have been less examined than those with a smaller share in the future burden. The research that has been conducted with young people has been mostly quantitative, with the survey method particularly dominant. Quantitative methods, and the subsequent data analysis, are reductive and typically removed from real-life context (Mason, 2017). In contrast, a qualitative approach enables a fuller exploration of adolescents' accounts, with a focus on depth rather than breadth.

A qualitative methodological approach gives voice to young people in that it is better placed to avoid prescribing or constraining their responses. Quantitative survey studies for example, typically focus on specific and often narrow topics of inquiry, such as determining how much adolescents know about the causes or consequences of climate change (e.g., Frappart, Moine, Jmel, & Megalakaki, 2016; Hermans & Korhonen, 2017), or how willing they are to take particular actions to mitigate climate change (e.g., Ambusaidi, Boyes, Stanisstreet, & Taylor, 2012; Chhokar, Dua, Taylor, Boyes, & Stanisstreet, 2011). This is beneficial; it is important to understand where gaps in knowledge exist and whether there is general support for or rejection of particular actions. It also facilitates international and age-based comparisons (e.g., Boyes et al., 2014). However, the frames of interest and response options are determined by adults and leave little or no room for participants to express themselves in a way they themselves might choose. Typically, participants cannot explain why they responded in a particular way, express whether what is being asked matters to them, or express what they themselves are concerned with. The qualitative approach here seeks – as far as is possible – to privilege the voices of adolescents and enable them to express more freely their own understandings of and ideas about climate change.

2.4 Criticisms of a qualitative methodological approach

There are many criticisms that can be made of a qualitative research approach, as is the case with any methodological approach. Some of these criticisms seem to be

a product of assessing qualitative research with evaluative criteria designed for and therefore better suited to quantitative research. I will discuss these here and attempt to counter some of the critique, before moving on to discuss more contentious issues.

2.4.1 Qualitative research is not ‘scientific’

Chief amongst the criticisms of qualitative research is that it is less ‘scientific’ than quantitative research. The prevailing belief that science entails measurement (Michell, 2003), and that science must be objective rather than subjective has led to a marginalisation of qualitative methods (Lamiell, 2018). Both of these beliefs are derived from ontological and epistemological assumptions that social reality is out there and accessible, in much the same way as reality in the natural sciences (Robson & McCartan, 2016). To address the first criticism, we must first ask *what* is being measured in quantitative research. In survey studies or experiments for example, proxy variables, not individual cognitions are measured. Results are aggregated using statistical techniques, so – somewhat counterintuitively – they end up telling us next to nothing about individuals at all (Lamiell, 2018). Ogden (2003) goes further, arguing that quantitative studies could actually be creating rather than accessing cognitions, particularly if the topic is novel or unfamiliar. At the very least, this suggests that ‘measurement’ in quantitative research is not necessarily a straightforward process.

In terms of the second criticism relating to objectivity, I would contend that objectivity is something of an illusion within any research methodology. No research comes from nowhere; a researcher working on any social science project – be it quantitative or qualitative – can never be entirely separate from his or her project (Braun & Clarke, 2013). Even the numbers produced by statistics in quantitative research – on the face of it objective – are subjected to subjective interpretation; researchers interpret numbers, numbers do not interpret themselves (Lamiell, 2018). So whilst quantitative research may value objectivity and be ‘more’ objective - or less subjective - than qualitative research, it cannot claim to be free of subjectivity. The true division seems to be that qualitative research makes a virtue of subjectivity whilst quantitative research does not (Braun & Clarke, 2013). Perhaps a more fruitful approach than one privileging objectivity might be one that simply privileges the approach and method that is most appropriate for a particular object of inquiry (Slaney & Tafreshi, 2018).

2.4.2 Other criticisms of qualitative research

Having defended qualitative research from the claim that it is necessarily less scientific than quantitative research, it must be acknowledged that there are of course issues with a qualitative research approach. At the heart of these, are the uncertainties arising from a lack of consensus about what constitutes ‘good’

qualitative research, perhaps unsurprisingly, given that subjectivity is a cornerstone of qualitative research (Willig, 2017). First, is the issue of confidence in the findings of qualitative research. The quality of the analysis of qualitative research data is dependent on the skill of the researcher(s) involved in interpreting the data. It is always feasible that alternative interpretations of data could be made (Willig, 2013). This lack of clarity and certainty can undermine confidence in the findings of qualitative studies, especially when quantitative numbers appear to provide a sense of clarity and certainty in a much more self-evident fashion. This issue of clarity – or lack of – links directly to the principles underpinning quantitative and qualitative research. As already noted, a quantitative approach is concerned with measurement and a qualitative approach with sense-making (Lamiell, 2018). Sense-making is inherently messy and frequently contradictory, with the result that qualitative research findings can appear frustratingly indeterminate.

Collecting and analysing qualitative data is time-consuming, meaning that sample sizes are generally much smaller than in quantitative research. Although qualitative research does not seek to generalise, the smaller sample sizes raise understandable questions about whether ‘enough’ participants were recruited and whether ‘saturation’ has been reached (Saunders et al., 2018). What constitutes a suitable sample size in qualitative research is a question mired in uncertainty and debate (Vasileiou, Barnett, Thorpe, & Young, 2018). Some scholars suggest the use of quantitative techniques to determine saturation (Rowlands, Waddell, & McKenna, 2016). Others propose that the concept of saturation is not necessarily relevant to all qualitative approaches (O’Reilly & Parker, 2013), given that more data does not necessarily equate to more information (Mason, 2010). Once again, it appears there is no single ‘right’ answer. Here I have taken a pragmatic approach and attempted to balance the epistemological aim of acquiring depth of understanding (Fossey, Harvey, McDermott, & Davidson, 2002) with the practical reality of recruiting adolescents for a particular set of studies over a pre-determined time period.

2.4.3 Assessing the quality of qualitative research

The above discussion leads to the question of how the quality of qualitative research can be evaluated. Validity and reliability, long established as plumb lines for evaluating the quality of quantitative research, do not translate neatly to qualitative research. There is no consensus about what reliability and validity mean in qualitative research, or even agreement about whether these concepts are appropriate or relevant (Rolfe, 2006), given the diversity of qualitative approaches (Yardley, 2000). Some scholars have suggested that quality criteria should not apply to qualitative research at all (e.g., Seale, 1999); others have proposed evaluative criteria for qualitative research (e.g., Elliott, Fischer, & Rennie, 1999; Henwood & Pidgeon, 1992). A 2018 review suggested that there are over 100 tools for assessing quality in qualitative research (Majid & Vanstone, 2018). It seems

neither sensible nor appropriate to eschew any quality assessment criteria, not least because an absence of any evaluation may fatally undermine confidence in the findings and practical utility of the research. In the absence of definitive criteria for the evaluation of qualitative research, I adopt the broad set of suggestions proposed by Yardley (2000), that good quality qualitative research should demonstrate:

- Sensitivity to context, for example, theoretical, cultural environment, ethical issues
- Commitment and rigour, for example, engaging with the topic, data collection, and analysis
- Transparency and coherence, for example transparency of data description, reflexivity
- Impact and importance, for example, enriching theoretical understanding, having practical importance

2.5 Individual methods employed in the empirical studies

In this research, four qualitative, cross-sectional methods were employed: free association, analysis of secondary qualitative data, focus groups, and interviews. All data were analysed using thematic analysis (Braun & Clarke, 2006; Braun & Clarke, 2020), although a correspondence analysis was produced in Study 1 as a basis for further qualitative analysis. Given that much of the existing research is quantitative and survey-based (Lee et al., 2020), the first two studies used deliberately open-ended methods to explore the ways adolescents described and situated climate change when they were not prompted to focus on a particular aspect of the issue. First, the free association method (Szalay & Deese, 1978) was used to elicit spontaneous and unconstrained ideas about climate change (Peters & Slovic, 1996). The second study analysed the questions that adolescents asked scientists about climate change on an online forum. Control over the direction of enquiry was therefore in the hands of participants rather than researcher (Ripberger, 2011).

The aim of the third and fourth studies was to investigate particular issues in greater depth. Based on the insight that participants in the first two studies appeared to locate climate change more with others than themselves, the focus group study examined this concept in more detail. Five focus groups were conducted to explore where participants positioned the self and the other in relation to climate change. Focus groups offer a relatively more naturalistic means of collecting data (Wellings, Branigan, & Mitchell, 2000) and provide an environment for the co-creation and negotiation of social representations (Wibeck, 2014). Finally, given the conversations in the focus group study about climate injustice and the emergence of the youth climate movement, the final study employed in-depth semi-structured interviews to examine adolescents' views about the youth climate strike movement. Interviews are well suited to

exploring issues that participants have a particular interest or stake in (Braun & Clarke, 2013) and are flexible in enabling participants to take the conversation in a direction they wish (Rubin & Rubin, 1995).

2.6 Ethical considerations

Consideration of ethics is vital in any research conducted with human participants and perhaps all the more when the research is conducted with adolescents. Ethical issues could also be more complex when conducting qualitative research (Lincoln, 2009). This is because qualitative research tends to be less fixed than quantitative research; for example, it is not necessarily possible to know in advance exactly what will be discussed in an interview, even when an interview schedule is followed.

The discipline of psychology takes a deontological approach to ethics, meaning that ethicality is judged by the process rather than the outcome (Braun & Clarke, 2013). Taken to its logical conclusion, this means that it would not be deemed acceptable to expose participants to an unethical process, even if one could be certain of a beneficial outcome. The core ethical requirements that must be adhered to in the UK are the British Psychological Society's Code of Ethics and Conduct (BPS, 2018). The code centres on four ethical principles: respect, competence, responsibility, and integrity. Also relevant to this research is the Code of Human Research Ethics (BPS, 2014), that contains additional guidelines relating to conducting research with vulnerable groups such as children under 16 years of age, as research involving vulnerable groups is deemed to be high risk.

In practice in this research, this meant that where participants were under 16, parental consent for the in-person research studies – as well as participant assent – was obtained. Further, since under 16s are deemed a vulnerable population, additional safeguards must be in place. In this instance, I acquired a DBS check (the government's Disclosure and Barring Service confirms eligibility by checking for a criminal record) through University of Bath to gain clearance to conduct research with adolescents. When interacting with the participants, the principles of informed consent, confidentiality, anonymity, right to withdraw, lack of deception, and debriefing (Willig, 2013) were adhered to. It was not anticipated that participants would experience any distress over and above that which might be experienced in everyday life as a result of taking part in the research. However, I was mindful that the topic of climate change could potentially provoke negative feelings and distress and took care to monitor participants' continuing assent throughout.

Ethical approval for each of the empirical studies described in 3.5 above was given by University of Bath. Approval numbers respectively are 17-020, 17-026, 18-316, and 19-115 (Appendix 1).

2.7 Reflexive commentary

An essential component of qualitative research – and one aligned with an approach that values subjectivity – is reflexivity. This entails a researcher reflecting on their own standpoint and demonstrating an understanding of the ways their own position and perspective might have influenced and shaped their research (Braun & Clarke, 2013). Here, I have chosen to reflect on two ways I think my own standpoint has impacted the research. First, my parental status influencing the choice of the topic of study and second, the impact of my age on the ensuing dynamic with participants and their parents.

When I was offered the opportunity to apply for an ESRC doctoral scholarship in the sustainable futures pathway with a free rein to devise a fitting proposal in any relevant topic area, I gravitated immediately to adolescents and climate change. At this point, I had no idea what research already existed and to what extent it was a plausible and sensible topic of investigation. In truth, my decision-making (perhaps unconscious at first) was almost certainly influenced by my being a parent to three adolescents. With this in mind, I am not – and would make no claim to be – neutral about the impact of climate change on young people. I am concerned about what the future holds for my children and their peers, and in truth, more concerned now than I was at the start of the PhD. At the same time, having the opportunity to talk with and listen to adolescents over the course of the PhD has been a source of inspiration and given me some hope for the future prospects of their generation.

I think it likely that my age – I would probably be of a similar age to the participants' parents – has impacted the research process. Somewhat unexpectedly, several parents seemed very reassured by my being middle-aged. For example, one parent of a prospective participant called me up specifically to ask me how old I was. When I told her, she expressed relief that I wasn't "one of those 23-year-old students". It seems possible then, that my age was beneficial in terms of recruitment, given that participants had to be recruited through parental gatekeepers. In terms of relating to the participants themselves, my experience of being around adolescents meant that I did not feel uncomfortable at the prospect of conducting research with this age group. I felt that the in-person interactions in the focus group and interview studies went well and participants seemed to feel at ease. Certainly, they did not seem to feel that they needed to hold back when talking about the blameworthiness of the old and middle-aged. I made every effort to assure participants that they were not being tested, that there were no right or wrong answers. On the other hand, I certainly cannot claim to be an 'insider', and cannot know whether our interactions would have been different or in some way 'better' had I been much closer to their own age (Dwyer & Buckle, 2009). I took care to be mindful of the inherent power imbalance between me, an adult researcher, and the adolescent participants, which even when attended to is ever present (Karnieli-Miller, Strier, & Pessach, 2009).

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Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.								
Signed						Date	01/12/20		

3 Youth perceptions of climate change: A narrative synthesis

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¹ 'ideological' on p. 57 should read 'idealistic'.



Youth perceptions of climate change: A narrative synthesis

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**Edited by Lorraine Whitmarsh,
Domain Editor, and Mike Hulme,
Editor-in-Chief****Abstract**

Despite the scale of the predicted impact of climate change on future generations, most of the academic literature investigating perceptions of climate change relates to adults or young adults rather than children and adolescents. In this review, we synthesize literature relating to 8- to 19-year-old's perceptions and understandings of climate change, in order to identify trends and inconsistencies, potential gaps in knowledge, and directions for future research. A comprehensive search strategy identified 51 international studies, using quantitative ($n = 36$), qualitative ($n = 9$), and mixed methods ($n = 6$). The included studies date from 1993 to 2018. The analysis outlines levels of reported belief and concern about climate change and perceptions of its causes and consequences. It also details reported perceptions of viable solutions to climate change and notions of responsibility for implementing these. Scientifically accurate knowledge generally increased with age, although misconceptions persisted across the age range. In some studies, younger children expressed greater concern and were more willing to take action than older adolescents. Levels of belief, concern, and willingness to take action were lower in the United States, United Kingdom, and Australia than in other countries. In conclusion, we discuss potential explanations for these age and place-related differences, examining the age-related findings in the context of concepts and theories in developmental psychology. We outline the limitations of our review and the reviewed studies, and note potential avenues for future research and implications for educational policy and practice.

This article is categorized under:

Perceptions, Behavior, and Communication of Climate Change >
Perceptions of Climate Change**KEYWORDS**

adolescents, children, climate change, review

1 | INTRODUCTION

Youth voices on climate change have never been more important, or more widely publicized. The first sign of youths' growing unrest on climate action appeared when students skipped school to attend a "climate strike" to

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1 of 24

coincide with the 2015 UN Conference of the Parties (COP21) in Paris. In August 2018, the 15-year-old Swedish climate activist Greta Thunberg started a protest: “Skolstrejk för klimatet” (“School strike for climate”). Thunberg caught international press attention, and the campaign—known by various names, including “Fridaysforfuture,” “Youthforclimate,” and “Youthstrike4climate”—snowballed, following the COP24 in December 2018. On March 15, 2019, thousands of young people from more than 100 countries walked out of school to demand that their governments take action to prevent further climate change. These demands were explicitly related to the fact that their generation will be more affected by a failure to deal with climate change (Warren, 2019). Their action and demands received the support of many scientists and scholars (Hagedorn et al., 2019; Scientists for Future, 2019).

Monthly protests have continued, with an estimated 6 million young people across the world taking action during the week commencing September 20, 2019 (Taylor, Watts, & Bartlett, 2019). Notably, the September strike reached beyond youth voices to engage a wider public audience (Thunberg, 2019). These young voices have raised concern that they will be faced with the ongoing and escalating challenges that climate change will present and that their future lives will be affected by its impact. Their ongoing action has the potential to influence public opinion, which may in turn determine the direction of travel of future climate change policy (Capstick et al., 2015). In this context, it is a matter of urgency that we understand the way children and adolescents view climate change—and where they see themselves and their actions in relation to it. This can inform the design of appropriate educational opportunities and identify other ways of supporting and equipping them to contend with these challenges in an age-appropriate manner.

To date, the majority of academic research investigating perceptions of climate change and responses to it, relates to adults (Weber, 2010). Work that does examine youth voices tends to focus on, or include, data relating to young adults (Corner et al., 2015; Hibberd & Nguyen, 2013) rather than on children or adolescents. Here, we attempt to understand what is currently known about children and adolescents' understandings of climate change at the individual level. To do so, and to highlight gaps in current knowledge, we explore their conceptualizations of climate change by reviewing the existing academic literature. We synthesize evidence from the fields of educational science, psychology, geography, and the broader environmental social sciences. We outline what the reviewed studies reveal about children and adolescents' beliefs and concerns about climate change and their perceptions of its causes, impacts, and solutions. We focus on these particular concepts due to a significant body of evidence which suggests that they relate to a wide range of pro-environmental behaviors (Bord, O'Connor, & Fisher, 2000; Capstick et al., 2015). We aim to identify trends and inconsistencies and to discuss the substantive and methodological implications of our findings. We also situate findings in relation to developmental psychology theories, and highlight gaps in knowledge to signal fruitful directions for further research in this field.

The research questions are as follows:

1. What are children and adolescents' perceptions of climate change in relation to its causes, impacts, and solutions?
2. What differences in perceptions can be observed across time, space, and age of participants?

2 | METHODS

2.1 | Search strategy

The literature search was conducted in May 2017 and updated in May 2019. The following databases were searched: PsychNet (including PsychInfo and PsychArticles), Web of Science, Scopus, Eric, British Education Index, Child Development and Adolescent Studies, Science Direct, IBSS, A+ Education, Education Source, PLoS One, and Ovid.

The keyword Boolean search included the following words: (child* OR adolesc* OR teen* or youth) AND (“climate change” OR “climatic changes” OR “global warming”) AND (conce* OR perc* OR “ideas about” OR “views about” OR belie* OR think* OR understand* OR comprehend* OR literacy OR assump* OR attitude* OR idea*).

In line with our first research question, the search was designed to capture literature relating specifically to “perceptions” of climate change, rather than to any related concepts such as emotions or coping. It was also designed to include only peer-reviewed journal articles, since searching for gray literature can be problematic (Monroe et al., 2017). This search strategy was intended to strike a balance between being sufficiently broad (to facilitate the inclusion of a wide range of studies) and sufficiently bounded (to enable the synthesis of these studies). The inclusion and exclusion criteria are detailed in Table 1. The initial search yielded 1,396 results screened by abstract or title.

Duplicates were removed and 127 studies were obtained and the full texts examined in relation to the inclusion and exclusion criteria. Where there was uncertainty about the fit to the criteria, one of the authors reviewed the paper and any disagreement was resolved before proceeding. Twenty-seven studies were included and 100 were excluded. In addition, we conducted backward (by searching citations of the included papers) and forward (via Google Scholar citations) searches to source relevant additional papers. An additional 22 studies were found that met the inclusion criteria. Most of these studies were international and used the word “student” rather than “child,” or specified synonym, and were not picked up in the original search. Three further studies were added in 2019. Detail of the application of the inclusion and exclusion criteria is outlined in Figure 1.

TABLE 1 Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> • Participants (living anywhere in the world) aged between 6 and 18 years • The research question or objective refers to the participants' beliefs, attitudes or conceptualization of climate change, in relation to concept, cause, consequence, or solution • Studies that include a measure of, or report on, children's perceptions of climate change. If the study reports an educational intervention, it must include a baseline or control measure of these perceptions • Studies relating to the greenhouse effect, since this is explicitly linked to climate change. Papers relating to sustainable practices such as recycling included only if reported in relation to climate change • Studies written in English • Studies are published in peer-reviewed journals 	<ul style="list-style-type: none"> • Studies where more than a third of the participants are outside of the age range of 6–18 years • Theoretical studies with no empirical findings • Intervention studies that did not provide any pre-intervention or control data

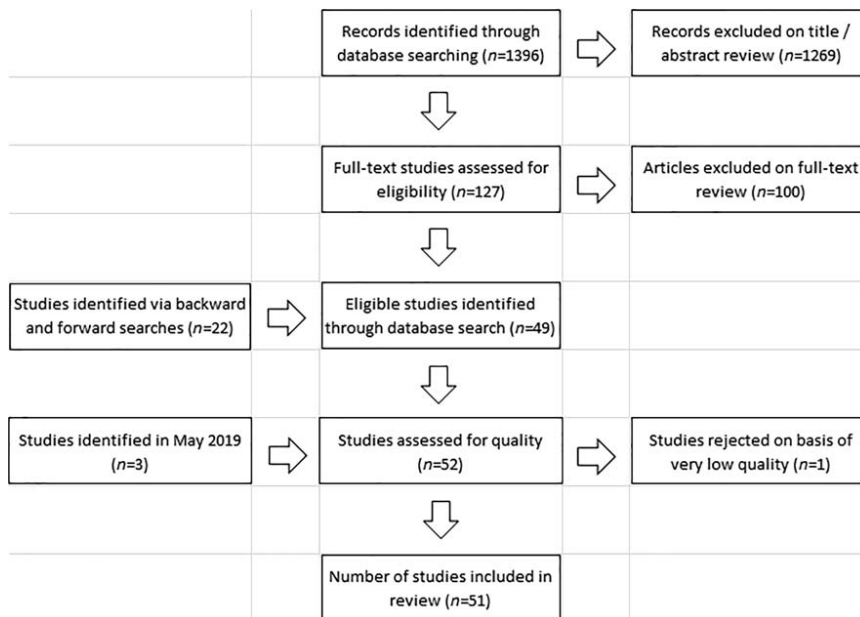


FIGURE 1 Result of search and quality control process

2.2 | Quality control

Each paper was rated for quality against 14 quantitative and 10 qualitative criteria (Kmet, Lee, & Cook, 2004). This assessment tool was chosen because of its applicability to a variety of disciplines; its use in a variety of reviews since its creation (Barnett et al., 2019; Williamson et al., 2017); and its detailed evaluation criteria for qualitative and quantitative studies. If a study employed mixed methods, it was assessed in each category, with evaluation criteria applied to each section and a mean score calculated. Quality ratings for the 52 studies were between 0.5 and 2.0 out of 2.0 (possible range 0–2). The study which scored 0.5 was removed as this was considered an unacceptably low rating, leaving 51 studies scoring between 1.1 and 2.0, where 1.4 and below was considered low quality, 1.5–1.7 medium, and 1.8 and above high quality. Lower quality studies typically scored poorly on criteria such as “clearly outlining research questions or objectives,” “outlining the recruitment process and participant characteristics,” or “reporting results in sufficient detail.”

2.3 | Analysis

Narrative synthesis (Popay et al., 2006) was used to synthesize the studies. This is appropriate for incorporating different types of evidence and for broader research questions than those addressed in effectiveness studies (Lucas et al., 2007). After studies were collated, the relevant detail was tabulated and textual descriptions produced for each of the included studies. This facilitated the development of groupings and clusters in relation to similarities, differences, and issues salient to the research questions.

3 | RESULTS

3.1 | Description of included studies

We included 51 studies, of which 10 were rated low quality, 25 medium quality, and 16 high quality. Of these, 36 were quantitative, six mixed methods, and nine qualitative studies.

The total number of participants was 41,515 across all 51 studies. The largest participant sample from a single study was 12,627 and the smallest was nine participants. The youngest participants were 8 and the oldest were 19. In 18 studies, the gender of participants was not stated, but where it was, the split was broadly even. The research was almost exclusively carried out in school settings. The studies focused on at least one of the following; climate change belief, concern, causes, impacts, and solutions. Eight of the studies employed an intervention design. The earliest papers were dated 1993, and 41 were published between 2007 and 2018. The number of studies published by year is shown in Figure 2. Of the 51 studies, 24 were conducted in the United States, United Kingdom, or Australia, and 38 were conducted in high income countries. The number of studies by country of origin and income status are shown in Table 2.

3.2 | Analysis of included studies

When reviewing the studies, it became evident that the concepts of climate change belief, climate change concern, the causes and impacts of climate change, and solutions to climate change, were examined through a range of terminological lenses. In recognition of the broad terminology employed in the reviewed studies, we use the term “reported perceptions” to encompass these diverse terms. Table 3 shows some exemplar terms that were used in the reviewed studies.

The sub-sections below relate to reported beliefs and concerns about climate change and perceptions about causes, impacts, and solutions. Studies relating to solutions have been separated into beliefs about viable solutions and notions of responsibility. Where appropriate, comparisons across age of participants, country of origin, and time were carried out.

3.3 | Reported belief and concern about climate change

The studies investigating belief typically asked participants to indicate how sure they were that climate change is happening. Belief has been interpreted here to have measured levels of certainty (as opposed to ignorance; Center for

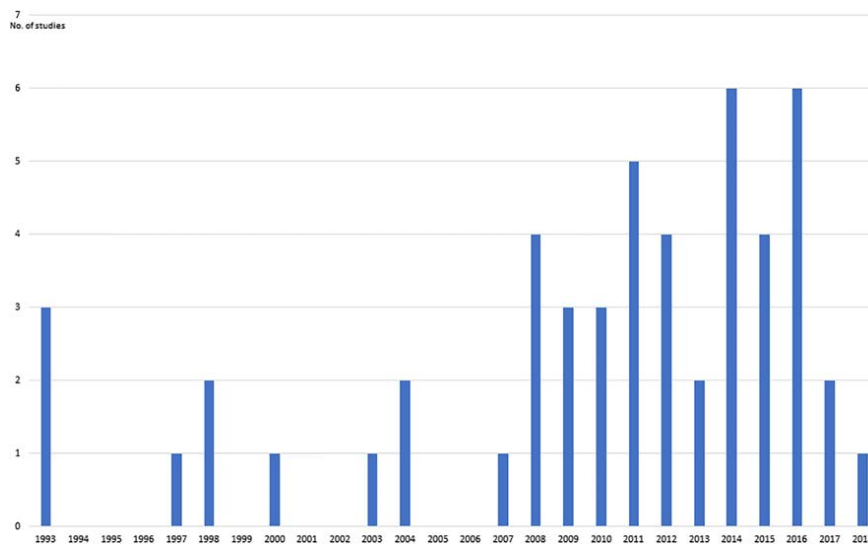


FIGURE 2 Number of reviewed studies per year

Research on Environmental Decisions, 2009), rather than skepticism (which is instead associated with a value-based rejection of the widespread scientific consensus of climate change; Capstick & Pidgeon, 2014). Levels of reported belief and concern about climate change were closely aligned. Belief and concern were higher in lower middle and upper middle income countries than in high income countries. There were 13 studies which detailed participants' levels of belief that climate change is occurring (Ambusaidi et al., 2012; Boyes et al., 2014; Boyes, Skamp, & Stanisstreet, 2008; Boyes & Stanisstreet, 2012; Chhokar et al., 2011, 2012; Devine-Wright et al., 2004; Malandrakis et al., 2011; Skamp et al., 2009; Stevenson et al., 2014; Stevenson, Peterson, & Bondell, 2016; Stevenson, Peterson, & Bradshaw, 2016; Tranter & Skrbis, 2014) and 15 studies which examined participants' level of concern about climate change (Ambusaidi et al., 2012; Boyes et al., 2014; Boyes, Skamp, & Stanisstreet, 2008; Boyes & Stanisstreet, 2012; Boyes, Stanisstreet, & Yongling, 2008; Chhokar et al., 2011, 2012; Hermans & Korhonen, 2017; Jackson & Pang, 2017; Line et al., 2010; Malandrakis et al., 2011; Prudente et al., 2015; Skamp et al., 2009; Stevenson, Peterson, & Bondell, 2016; Tranter & Skrbis, 2014). These studies employed a Likert-scale questionnaire (one study investigating belief utilized a 1–10 scale; Tranter & Skrbis, 2014). Belief—defined as being “sure” or “thinking” climate change is occurring—and concern—defined as being “very” or “quite” worried about climate change—was highest in Turkey, at 93 and 91%, respectively. Belief (61%) and concern (50%) was lowest in the United Kingdom (Boyes et al., 2014). There was evidence of local differences, with children living in coastal areas more concerned than those living in rural areas of the Philippines, for example, Prudente et al. (2015).

Some studies explored the relationship between situational or personal factors and climate change belief and concern. A more collaborative and nature-oriented learning environment was associated with higher levels of belief that the climate is changing in the United Kingdom (Devine-Wright et al., 2004). Levels of belief were higher for 11–15-year-old American children who held “communitarian” rather than “individualistic” worldviews, where knowledge about climate change was “low” (Stevenson et al., 2014). At “high” knowledge levels, the difference between the two groups' scores were not substantial, suggesting that knowledge may supersede the effects of worldview to impact climate change belief. However, information inconsistent with worldview did not influence belief in climate change in 16–17-year-old Australian participants (Tranter & Skrbis, 2014). Talking about climate change, even with someone skeptical about it, was related to increased levels of concern (Stevenson, Peterson, & Bondell, 2016). Concern about climate change was not necessarily static but context-dependent. In one qualitative study using visual methods and interviews (Line et al., 2010), participants did express some concern about climate change but this was lessened in the context of considering the personal benefits of actions, such as driving rather than taking a bus. Here, climate change was also reported to be less important than more immediately pressing issues such as exams and homework.

Location	No. of studies
International (Australia, Brunei, Greece, India, Korea, Oman, Singapore, Spain, Turkey, USA, UK)	1
High income countries	
USA	11
UK	7
Australia	6
Greece	2
Australia and UK	1
England and Sweden	1
Sweden	1
Singapore	1
Italy	1
Canada	1
New Zealand	1
Oman	1
France	1
Spain	1
Finland	1
Hong Kong	1
Upper middle income countries	
China	3
Fiji	1
Malaysia	1
Lower middle income countries	
Turkey	3
India	3
Philippines	1

TABLE 2 Country of origin of reviewed studies split by income status (World Bank, 2019)

TABLE 3 Exemplar terms used in reviewed studies

Reported perceptions of	Exemplar terms used in the studies
Belief	Certainty that global warming is happening Belief that climate is changing
Concern	Climate change concern Concern over the risks of global warming
Causes	Conceptions, attitudes, ideas, alternatives or misconceptions, understanding, notions, prior knowledge, preconceptions, understandings, alternative conceptions, beliefs, perceptions
Impacts	Ideas, misconceptions, conceptions, notions, prior knowledge, preconceptions, perceptions
Solutions	Degree of willingness to act (in relation to particular solution) Believed usefulness of action (of particular solution), ideas, alternatives or misconceptions, conceptions, understanding, notions, prior knowledge, preconceptions, moral reasoning, perspectives, attitudes, beliefs, interpretative repertoires

Where age-related comparisons could be made, some differences were noted. In two Indian studies with participants aged 17–18 years (Chhokar et al., 2012), and 11–16 years (Chhokar et al., 2011), the level of belief was almost the same. However, more of the 11–16-year-olds (90%) were very or quite worried about global warming

than the 17–18-year-olds (82%). One study examining the responses to global warming of children in their last year of primary school and first year of secondary school (Skamp et al., 2009), reported that more of the primary-aged children (75%) believed that global warming was happening now than the secondary-aged children (65%). In the same study, 66% of the primary students were worried about global warming compared to 55% of the secondary students.

3.4 | Reported perceptions about causes of climate change

There were 26 studies that detailed participants' reported perceptions about the causes of climate change (Andersson & Wallin, 2000; Boyes et al., 1993; Boyes & Stanisstreet, 1993, 1997; Chang & Pascua, 2016; Dawson, 2015; Frappart et al., 2016; Garg & Lal, 2013; Hestness et al., 2016; Jackson & Pang, 2017; Karpudewan et al., 2015; Kilinc et al., 2008; Koulaïdis & Christidou, 1999; Lee et al., 2007; Mason & Santi, 1998; Özdem et al., 2014; Prudente et al., 2015; Pruneau et al., 2003; Punter et al., 2011; Puttick et al., 2015; Scott-Parker & Kumar, 2018; Shepardson et al., 2009, 2011; Stevenson, Peterson, & Bradshaw, 2016; Taber & Taylor, 2009; Varma & Linn, 2012). The studies mostly employed questionnaires (Boyes & Stanisstreet, 1997), but also used interviews (Chang & Pascua, 2016; Karpudewan et al., 2015; Mason & Santi, 1998; Pruneau et al., 2003), draw and explain tasks (Shepardson et al., 2009, 2011), open-ended writing prompts (Lee et al., 2007), interviews and drawing tasks (Hestness et al., 2016), and focus groups (Scott-Parker & Kumar, 2018).

Participants' ideas about the causes of climate change tended to be vague and general (Dawson, 2015; Taber & Taylor, 2009; Varma & Linn, 2012). Concepts were often broad and unspecific, relating to "pollution" rather than to particular gases or underlying mechanisms (Koulaïdis & Christidou, 1999). Participants were often aware that burning fuels creates carbon dioxide (Boyes & Stanisstreet, 1997), although this was more often attributed to transport and factories than to household energy use (Punter et al., 2011). There was some appreciation of the wider basket of greenhouse gases contributing to anthropogenic climate change (Hestness et al., 2016), but carbon dioxide was the most highly identified greenhouse gas (Chang & Pascua, 2016).

Scientifically accurate knowledge about the causes of climate change tended to increase with the age of participants. For example, a study of youth voices from the Scout Movement found that participants aged 9–11 had less accurate knowledge about causes than those aged 12–14 (Puttick et al., 2015). In a French study, participants aged 17 gave more correct answers to questions about causes of the enhanced greenhouse effect than those aged 12 or 15 (Frappart et al., 2016). However, persistent misconceptions about the causes of climate change were frequently reported, irrespective of age. One recurring observation was the tendency to conflate the concepts of climate change and ozone layer depletion. This was reported consistently in earlier studies (Boyes et al., 1993), with over 80% of participants in all age groups (between 10 and 16) suggesting that the greenhouse effect is made worse by holes in the ozone layer. In later studies, climate change-ozone conflation was not always observed (Punter et al., 2011) but the proportion of participants identifying ozone depletion as a cause of climate change was still sometimes considerable (42% in one recent American study, Hestness et al., 2016 and 50% in another, Stevenson, Peterson, & Bradshaw, 2016). In a later Indian study with participants in the 9th, 10th, and 11th grades (Garg & Lal, 2013), more of the older than younger students thought ozone depletion was implicated in global warming, despite being generally better informed about causes. Other misconceptions about causes were also commonplace, with environmentally unsound actions such as street littering or river pollution reported to cause climate change (Kilinc et al., 2008).

3.5 | Reported perceptions about impacts of climate change

Overall, 18 studies outlined participants' reported perceptions about the impacts of climate change (Boyes et al., 1993; Boyes & Stanisstreet, 1993; Dogru & Sarac, 2013; Frappart et al., 2016; Garg & Lal, 2013; Hermans & Korhonen, 2017; Hestness et al., 2016; Jackson & Pang, 2017; Karpudewan et al., 2015; Kilinc et al., 2008; Lee et al., 2007; Mason & Santi, 1998; Pruneau et al., 2003; Punter et al., 2011; Scott-Parker & Kumar, 2018; Shepardson et al., 2009, 2011; Stevenson, Peterson, & Bradshaw, 2016). Questionnaires were the most frequently used method of data collection (Kilinc et al., 2008). Studies also employed open-ended writing prompts (Lee et al., 2007), interviews (Jackson & Pang, 2017; Karpudewan et al., 2015; Mason & Santi, 1998; Pruneau et al., 2003), draw and explain tasks (Shepardson et al., 2009, 2011), interviews and drawing tasks (Hestness et al., 2016), and focus groups (Scott-Parker & Kumar, 2018).

The accuracy of reported knowledge about the impacts of climate change varied according to the method employed. In one open-response study (Pruneau et al., 2003) only two of 39 participants were able to think of any impacts of climate change. Where closed-form questionnaires were used, awareness of the most evident impacts of climate change, such as increasing temperatures and melting ice caps was high, as was the recognition that climate change would alter Earth's ecosystems (Lee et al., 2007; Shepardson et al., 2011). However, ideas were frequently incomplete, exemplified by a focus on the impact on "wild" animals and plants rather than livestock and agriculture (Shepardson et al., 2009), or a lack of appreciation that a changing climate may cause an increase in the number of crop pests (Frappart et al., 2016). Similarly, although appreciation of rising temperatures was high, the potential for increasing desertification was less well observed (Boyes et al., 1993). Nor were the wider socio-economic impacts of climate change, such as migration (Punter et al., 2011), well recognized.

There were erroneous ideas about the impacts of climate change consistent with misconceptions held about causes, particularly around the hole in the ozone layer. In one study, over 20% of participants reported that diagnoses of cancer would increase as a result of climate change (Punter et al., 2011). Awareness of climate change impacts on natural systems was typically higher than impacts on human systems.

3.6 | Reported perceptions about solutions to climate change

A majority of studies (40) reported participants' perceptions about potential solutions to climate change (Ambusaidi et al., 2012; Andersson & Wallin, 2000; Bofferding & Kloser, 2015; Boyes et al., 1993, 2014; Boyes, Skamp, & Stanisstreet, 2008; Boyes & Stanisstreet, 1993, 2012; Boyes, Stanisstreet, & Yongling, 2008; Byrne et al., 2014; Chhokar et al., 2011, 2012; Daniel et al., 2004; Devine-Wright et al., 2004; Francis et al., 1993; Frappart et al., 2016; Garg & Lal, 2013; Hermans & Korhonen, 2017; Hestness et al., 2016; Jackson & Pang, 2017; Karpudewan et al., 2015; Kilinc et al., 2008; Kirk, 2008; Lee et al., 2007; Line et al., 2010; Malandrakis et al., 2011; Mason & Santi, 1998; Özdem et al., 2014; Pruneau et al., 2003; Punter et al., 2011; Puttick et al., 2015; Scott-Parker & Kumar, 2018; Shepardson et al., 2009, 2011; Skamp et al., 2009, 2013; Sternäng & Lundholm, 2011, 2012; Taber & Taylor, 2009; Wilks & Harris, 2016). The studies mainly used questionnaires (Kilinc et al., 2008). Studies also employed interviews (Jackson & Pang, 2017; Mason & Santi, 1998; Pruneau et al., 2003), interviews and drawing tasks (Hestness et al., 2016), photo elicitation (Line et al., 2010), draw and explain tasks (Shepardson et al., 2009, 2011), focus groups/group interviews (Byrne et al., 2014; Scott-Parker & Kumar, 2018; Sternäng & Lundholm, 2011), and role play tasks (Sternäng & Lundholm, 2012).

The level of reported accuracy of knowledge varied according to the method employed. Two studies reported very low awareness of accurate solutions to climate change in response to open-ended questions (Lee et al., 2007; Pruneau et al., 2003). Generally, as with participants' concepts of causes and impacts, concepts of solutions to climate change were held at a superficial level and featured misconceptions. There was a tendency for participants to suggest actions for which they were not personally responsible (Punter et al., 2011; Shepardson et al., 2009). The most recognized solutions were planting trees (Kilinc et al., 2008) and reducing pollution (Garg & Lal, 2013), particularly from factories (Daniel et al., 2004) and transport (Bofferding & Kloser, 2015). However understanding was not complete, for example, the lag time involved in planting trees was not appreciated (Shepardson et al., 2009), and participants were not able to explain the mechanisms by which reducing pollution or planting trees would reduce global warming (Frappart et al., 2016).

Scientifically incorrect ideas about solutions were also noted, such as believing that using unleaded petrol was a solution to global warming (Kilinc et al., 2008). Levels of incorrect knowledge such as this sometimes increased with age (Boyes & Stanisstreet, 2012). Other erroneous solutions, such as reducing street litter or river pollution (Hestness et al., 2016) were observed. Again, and consistent with a conflation of the ozone layer and climate change, the suggestion that reducing chlorofluorocarbons (CFCs) would reduce global warming was frequently reported (e.g., Daniel et al., 2004), where reducing CFCs was perceived to be a more effective way of combatting climate change than flying fewer aeroplanes; although CFCs have a high radiative potential, since the implementation of the Montreal Protocol, they are no longer a significant concern for climate policy—unlike flights, which represent a currently unconstrained and rapidly growing source of greenhouse gas emissions. Nuclear power was not commonly accepted to be a solution to the problem of climate change (Boyes, Stanisstreet, & Yongling, 2008; Hestness et al., 2016), despite it being seen in general as a necessary climate change-energy stopgap (Pidgeon, Lorenzoni, & Poortinga, 2008).

3.7 | Notions of responsibility and endorsement of solutions to climate change

Nine studies used the same version of a closed-form survey (Ambusaidi et al., 2012; Boyes, Skamp, & Stanisstreet, 2008; Boyes & Stanisstreet, 2012; Boyes, Stanisstreet, & Yongling, 2008; Chhokar et al., 2011, 2012; Malandrakis et al., 2011; Skamp et al., 2009, 2013) to investigate the disparity between the extent to which participants felt that solutions to climate change were effective, and their willingness to enact them. The questionnaire paired Likert-scale ratings of the perceived effectiveness of indirect and direct actions with a rating of the participant's willingness to undertake that action personally. There were 12 direct actions (such as switching off appliances or eating less meat) and four indirect actions (such as supporting "greener" taxation or legislation). These studies were carried out across several countries, with participants of different ages.

A consistent finding in these studies was the disparity between how willing participants stated they would be to take certain actions relative to how useful they perceived them to be. This varied by country of origin and to a lesser extent age. Participants were generally more willing to take more convenient direct actions such as switching off appliances, even though they recognized that these actions were less effective (Skamp et al., 2009). They were less willing, relative to perceived usefulness, to take direct actions which had a greater personal impact, such as buying fewer new items, or taking public transport (Boyes & Stanisstreet, 2012). In high income countries such as Australia, there was a greater disparity between the perceived usefulness of indirect actions and participants' willingness to endorse them than for most direct actions. For example, participants were much less willing to vote for environmental taxation and legislation relative to the extent to which they thought they were useful actions (Boyes, Skamp, & Stanisstreet, 2008; Skamp et al., 2009). The perceived usefulness of indirect actions was high in India and Oman, and participants there were also much more willing to support these actions (Ambusaidi et al., 2012; Chhokar et al., 2011).

This disconnect between the perceived usefulness of actions and willingness to take them was mirrored in other studies not using this particular questionnaire. Indirect actions were deemed beneficial but not personally endorsed in a focus group study (Kirk, 2008). Participants expressed an understanding that reducing car usage was necessary from the point of view of climate change but their personal priorities meant they were not willing to travel by car less often (Line et al., 2010) or take actions that were personally inconvenient (Hermans & Korhonen, 2017), prioritizing their own interest and wellbeing over their environmental worries (Byrne et al., 2014). Perspective and context were related to allocation of responsibility. In a role play study (Sternäng & Lundholm, 2011) participants playing a factory owner absolved themselves of responsibility and placed it instead on technology. However, when the factory owner was an "other," they advocated the government should legislate against them.

Age appeared to be related to participants' stated willingness to take action. In some studies, younger children were more willing to take actions than older children. For example, in a Greek study fewer of the participants in Year 10 (48%) were willing to "undertake more environmental education" than those in Year 7 (62%), despite endorsing it as a useful action (Malandrakis et al., 2011). In an Omani study with participants aged 11–18, fewer of the older participants (49%) were willing to reduce their meat consumption than the younger participants (62%) (Ambusaidi et al., 2012). Older participants were less willing to use environmentally friendly transportation than younger participants, despite an increasing recognition of the benefit to the climate. In one Indian study, 47% of 16-year-olds were willing to use buses or trains instead of cars, compared to 67% of 11-year-olds (Chhokar et al., 2011). In an Australian study, 8% of participants in their first year of secondary school were willing to take public transport rather than travel in cars, compared to 26% of participants in their last year of primary school, despite similar numbers in both groups believing that using public transport would reduce global warming (Skamp et al., 2009). In the Omani study, fewer older students than younger were willing to drive smaller, more environmentally friendly cars (44% vs. 56%), or use public transport (29% vs. 37%) (Ambusaidi et al., 2012).

In an international study (Boyes et al., 2014), participants in 11 countries were asked how willing they would be to take two actions; drive smaller, more fuel efficient cars, and use public transport. They were also asked how useful they thought these actions were in reducing global warming. Overall, 84% of participants said that driving smaller cars would improve global warming by "a small but useful amount," "a fair amount," or "a lot." Fewer respondents (72%) said that they would "probably," "almost certainly," or "definitely" drive smaller cars. Participants in lower and middle income countries endorsed action more than those in Western high income nations. There were differences between high income countries too, with participants in high income Singapore much more willing to endorse action than those in the United Kingdom, United States, and Australia. Levels of agreement that taking public transport is a useful action were even higher than for driving smaller cars, at 92%. However, far fewer respondents (58%) agreed that they would be willing to take public transport. Again, geographical differences were observed with participants in the United Kingdom, Australia, and United States least willing. Ninety-six percent of Indian participants thought that the action was useful and 76% said they would take it

themselves. In Singapore, 96% agreed that the action was useful and 79% said they would take it. Belief that taking public transport is a useful action was high in the United States (87%) and United Kingdom (90%), but only 37% (United States) and 38% (United Kingdom) were prepared to take that action.

4 | DISCUSSION AND CONCLUSIONS

The aim of this review was to explore children and adolescents' perceptions of climate change in relation to causes, impacts, and solutions and, where possible, to examine potential differences in these perceptions across time, place and age of participants. Our analysis of these studies—all of which were cross-sectional—identified notable differences between participants across different countries and of different ages. Temporal differences were less prominent, probably because most studies were published post-2007 (Figure 2). One exception is the observation that the propensity to conflate climate change with the ozone layer does seem to have reduced over time. Earlier studies report higher levels of this conflation than later studies, although the numbers remain considerable. For example, in a 1993 study (Boyes et al., 1993), 63% of participants agreed that the greenhouse effect was made worse by holes in the ozone layer. In a 2016 study (Hestness et al., 2016), 42% of participants attributed global warming to ozone layer depletion. Most studies focused on the scientific accuracy of participants' knowledge. Scientifically correct knowledge of the most evident causes, impacts, and solutions, such as factory emissions, rising temperatures, and reducing CO₂ in the atmosphere was generally reasonably high. However, ideas were often confused or incomplete, and misconceptions were commonplace. The level of scientifically accurate knowledge was typically higher for impacts and solutions than for causes (Frappart et al., 2016; Puttick et al., 2015). Some ideas about impacts and solutions appeared based on misconceived causes, representing conceptualizations of climate change that are to some degree plausible, but flawed. Where reported, there was low awareness of the broader economic, geo-political, and infrastructural considerations associated with climate change (Punter et al., 2011).

A focus on accuracy of knowledge means that the review provides a partial insight into children's thinking about climate change and may not be reflective of their climate-related behavior, given the relatively minor role knowledge plays in predicting this (Kollmuss & Agyeman, 2002). Further, where climate change is concerned, knowledge may be differentiated (Frick, Kaiser, & Wilson, 2004), such that system knowledge (understanding mechanisms, such as how CO₂ increases temperatures) is only weakly associated with behavior whereas action and effectiveness knowledge (knowing what actions are effective and which actions are relatively more or less effective) are more strongly associated (Braun & Dierkes, 2019). System knowledge in these studies was generally poor and (misconceptions aside), action and effectiveness knowledge was relatively better.

4.1 | Age differences

Scientifically correct knowledge about the causes, impacts, and solutions to climate change generally increased with age, as would be expected with increased scientific education and exposure to information. However, misconceptions persisted across age groups and were in some cases reported more by older than younger children. The misconceptions recorded here mirror common youth, young adult, and adult misconceptions about climate change (Corner et al., 2015; McCaffrey & Buhr, 2008), such as misunderstandings about the relationship between the ozone layer and climate change. This likely reflects two aspects of children's learning. First, children are reliant on information given to them by adults when considering any complex scientific issue, so misconceptions recorded here probably reflect misinformation children are receiving from those around them (Harris & Koenig, 2006). Previous studies have shown that these errors are sometimes reinforced by formal environmental textbooks, and that common metaphors used to explain the mechanisms of climate change are frequently misconstrued (Dijkstra & Goedhart, 2012). Children are also more vulnerable to misinformation than adolescents and adults, as they have limitations in their capacity to process complex information and to assess the credibility of information they receive (Moutier et al., 2006). The potential for misunderstandings to persist remains high, as children have greater access to information about climate change through unmoderated sources like social media.

Second, scientific misconceptions, once established, can be difficult to overwrite. A substantial body of research has shown that misconceptions often become more intractable with age (Carey, 2009; Shtulman & Harrington, 2016). There is some evidence to suggest that younger children, up to 9–10 years of age, are more flexible about overwriting information in

their existing mental models than older children and adults (Kelemen & DiYanni, 2005). However, findings from conceptual change research (Reinfried & Tempelmann, 2014) show that the preconceptions that children hold at 13 years of age predict how readily they are able to create accurate mental models of global warming and climate change when they encounter them in formal education. Importantly, children's understanding of climate change models depends heavily on which of a small sub-set of preconceptions they arrive with. Here we see that misconceptions arise early in children's understanding of climate change and act as a barrier to further learning. The same misunderstandings seem to persist through adolescence and into adulthood. Directly addressing common climate change misconceptions early in education may prove more effective in disrupting their persistence into adulthood. Identifying a child's climate change preconceptions can help to develop the appropriate learning materials that most effectively overcome them.

In this review, levels of belief and concern about climate change, and willingness to take some actions—particularly those related to personal transport—declined with age. One explanation for this, tentatively supported by findings here, is that younger children's thinking about climate change is less reflective of worldview and cultural values than older children's (Stevenson et al., 2014; Tranter & Skrbis, 2014). Further, the “adolescent dip” in environmental attitudes and behaviors has been well documented (Liefländer & Bogner, 2014; Negev et al., 2008; Olsson & Gericke, 2015; Uitto et al., 2011; Uitto & Saloranta, 2010). Most recently, a longitudinal study examining developmental change in children's environmental attitudes and behavior between the ages of 7 and 18 (Otto et al., 2019) mirrored previous cross-sectional findings. It shows an average increase in environmental concern and willingness to act between the ages of 7 and 10, followed by a period of sustained concern and behavior, and finally a dip from 14 to 18 years. Environmental attitudes and behavior became more closely correlated with age, converging reliably in early adulthood, and the authors propose that this adolescent dip reflects discontinuities in the development of broader prosocial moral reasoning (Eisenberg et al., 1995). A simple explanation for this may be methodological: younger children likely have fewer opportunities to make decisions about issues such as how they are transported so can afford to be ideological. Adolescents, in contrast, will already be making some of these decisions and appreciate better the lack of convenience associated with more environmentally friendly choices. If the questions had revolved around choices in realms where younger and older children had roughly equal autonomy, these age differences may have been less apparent. It is also possible that adolescents go through a stage of more hedonistic values, which results in a period of lowered concern for others (Uitto & Saloranta, 2010), and lessened interest in nature (Kaplan & Kaplan, 2002). A more complex explanation suggests that rejection of climate change or reduced concern and willingness to act, may reflect coping strategies for young people who feel powerless to exert change (Ojala, 2012a, 2012b). So while scientifically accurate knowledge overall was shown to increase with age, the relationship between knowledge and willingness to take action was not at all straightforward. These findings are especially interesting in the context of recent youth climate strikes as many of the strikers would fall within the proposed “adolescent dip.” Further research is required to examine whether this apparent inconsistency is methodological (perhaps self-report on surveys does not reflect real-world behavior in this context), or reflects compelling contextual factors that override the adolescent dip, such as social pressure, greater exposure to age-related climate change information, a celebrity figurehead, and mounting societal concern.

4.2 | Place differences

The differences in levels of belief, concern, and willingness to act across location suggest that young people may be more or less concerned and willing to take action about climate change relative to the extent to which they feel the impacts are salient to them. This appears the case with adults (Spence, Poortinga, & Pidgeon, 2012) (although it should be noted that the link between psychological distance and action is not straightforward, Brügger et al., 2015). The lower levels of belief, concern, and willingness to act expressed by children in countries such as the United Kingdom, United States, and Australia could be explained by their viewing climate change as a distant and global (Chamila Roshani Perera & Rathnasiri Hewege, 2013) rather than local problem. This explanation is supported by the findings of a recent study investigating adolescents' perceptions of the psychological distance of climate change (Gubler, Brügger, & Eyer, 2019). Here, participants viewed climate change as a real and current threat, but one that affected other people and places more than themselves. Misconceptions aside, children in the same three countries seemed to have reasonably high awareness about which solutions to climate change are effective. However, relative to how effective they perceive those solutions to be, they were less willing to endorse them personally than they were to endorse actions they viewed as less effective, but less personally inconvenient. Their stated intention to perform these behaviors lagged well behind those in other high income countries such as Singapore or Oman. This potential psychological distancing (Troepe &

Lieberman, 2010) of the problem may reflect greater confidence in some countries that responsibility for climate change initiative lies with governments than with individuals (Pidgeon, 2012). Previous research (Otto et al., 2016) shows that income positively affects some pro-environmental behaviors (such as recycling) but negatively affects others (in sum, some environmentally unfriendly behaviors such as owning more than one car are dependent on resources) but here we find cultural variation in pro-environmental behavior even across countries where income is high.

This cross-cultural difference in young people's responses may also be explained by a nation's position on the democratic-autocratic or individual-collective indices, an interpretation considered in one study (Boyes et al., 2014). This could account for why children in more democratic countries such as the United Kingdom and United States, where power distance is less hierarchical than in relatively more autocratic nations such as Brunei or Oman, tend to put their own interests and desires above climate concern or why children in more collectivistic nations such as Singapore report higher levels of willingness to act because they are more inclined to think "for the greater good" (Triandis, 2001), than those in more individualistic nations such as Australia (Bronfenbrenner & Vasta, 1989; Whiting & Whiting, 1975). This interpretation is supported by the fact that even within the same country, belief and concern about climate change is higher in children with a more communitarian worldview than those with a more individualistic worldview (Stevenson et al., 2014). Studies with adults suggest that explanations for cross-cultural differences could include differences in underlying values, the influence of wider political systems, or educational experiences (Poortinga et al., 2019); factors which also play a role in young peoples' responses.

4.3 | Limitations

4.3.1 | Limitations of the review

We recognized that in order to provide meaningful insights in the context of a disparate literature, we had to set constraints on the bounds of the search. This has had an impact on the scope of the review, which relates only to perceptions of climate change, and excludes literature relating to relevant concepts such as coping with emotional responses to climate change. As we reviewed only peer-reviewed journal articles, the review did not include other potentially valuable sources of information, such as national and international polls (Eurobarometer, 2019; Yale Program on Climate Change Communication, 2019), or theses. Any relevant articles that were published outside of the searched databases could not have been captured. Only including articles written in English meant that important findings reported in other languages were not accessed. Given the recently increased scientific interest in this age group in the context of climate change, it is likely that additional, interesting insights—published in and after 2019—are not included in this review. There are clear limitations to the conclusions we have drawn about temporal and geographical variability. There was only one international study in the review, the majority of studies were conducted in high income countries (United Kingdom, United States, and Australia in particular), post-2007. In the main, we did not compare like for like across time and place, given studies employed different methods, and asked different questions to dissimilar samples of children and adolescents. We are beginning to see cross-cultural research relating to climate change perceptions in adults, but this is an emerging literature (Nash et al., 2019), particularly outside of Western settings.

4.3.2 | General limitations of studies included in the review

Some of the studies in the review were judged to be of relatively low quality. A number of quantitative studies did not adequately describe the characteristics of participants, or describe results in sufficient detail. Some qualitative studies did not describe their analysis in a systematic manner, or feature any reflexive commentary. Although several countries were represented in the review, the majority were high income nations. The largest number of studies were conducted in the United States, Australia, and the United Kingdom. Some studies examined the impact of situational factors but the majority focused on individual cognition, thus providing a narrowly focused understanding of the factors impacting children's climate change beliefs and potential behaviors (Gifford, Kormos, & McIntyre, 2011). The research was overwhelmingly conducted in school settings. Conducting research in school does of course aid recruitment and speeds the process of getting parental consent, where it is required (Fisher, 2019). However, participants may have felt they were sitting a "test," potentially making them feel inhibited or pressured to find the "right" answer. All studies were cross-sectional, which does not allow us to draw conclusions about how climate change conceptions may change over time in the same population.

4.3.3 | Methodological limitations of studies included in the review

Most of the studies in the review were quantitative and a large number of these utilized closed-form surveys. The use of introspective measures can lead to a number of common method biases, such as social desirability, item ambiguity, or demand characteristics. These are a source of measurement error (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003) and are known to affect research in this area (Otto, Kröhne, & Richter, 2018). Employment of the same survey in several studies was useful because it facilitated comparisons across locations, although comparisons need to be drawn with caution because questions may mean different things to participants in different countries. Local infrastructural factors will likely exert an influence on willingness and ability to act in certain ways. For example, in Hong Kong, public transport is heavily relied upon by necessity (Jackson & Pang, 2017) and stated willingness to use public transport could be predicated on the quality of transport infrastructure, rather than climate concern. There may be cultural differences in the way participants respond to Likert-style survey questions (Lee et al., 2002). Some of the survey questions were rather abstract, with children being asked about the likelihood of their carrying out behaviors that they will not be in a position to perform for many years, such as paying more for green energy, or paying more tax in order for more trees to be planted (Ambusaidi et al., 2012).

Survey and interview questions may be understood differently by children at different ages, making it difficult to interpret apparent developmental change. Language comprehension, cognitive development, and understanding of inner feelings relative to outward behavior all improve across the age-range of the participants in the reviewed studies, and all have been shown to have an impact on how children interpret and respond to the same survey and interview questions (Bishop & Said, 2012; Borgers, De Leeuw, & Hox, 2000; Morison, Moir, & Kwansa, 2000; Otto et al., 2018; Piaget, 1929; Podsakoff et al., 2003). For instance, children aged 8–11 years have more difficulties than older children with questions that are ambiguous or asking about broad rather than specific concepts. Questions with negations, such as “The government does not do enough to promote recycling” are commonly used in adult surveys and are considered good practice to ensure respondents are paying attention but are problematic for children below 11 years of age and yield inconsistent responses (Borgers et al., 2000). Children below 11 are also more likely to become inattentive or lose motivation than older children (Borgers et al., 2000). Both years in education and gender have been shown to reliably predict internal validity and non-responsiveness to survey questions (Benson & Hocevar, 1985; De Leeuw & Otter, 1995). Younger children are less likely to admit they have not understood a question and are more susceptible to leading questions (Morison et al., 2000). Between 8 and 18, substantial improvements are seen in children’s ability to create accurate mental models of scientific concepts with multiple interacting variables (such as climate change) and their ability to articulate or externalize these mental models in a variety of ways (Carey, 2009). As such, researchers interested in establishing children’s level of understanding emphasize the importance of piloting and pre-testing questions with children of different ages and from different locations when planning cross-age and cross-cultural comparisons. Drawing, making models, and using other visual aids to communication are often more effective for collecting high quality and reliable data from younger children in studies involving complex concepts such as climate change (Dahlquist, 1990; Priestley & Pipe, 1997).

It is revealing that in studies using more open methods, knowledge levels were much lower (Pruneau et al., 2003) than in closed-form questionnaire studies. This may be due to closed questionnaires—with response options outlined—enabling participants to display what appears to be higher knowledge levels, “creating” rather than “accessing” cognitions (Ogden, 2003). Or it could reflect a difference between measures that tap into implicit but superficial understanding and those that require children to explicitly articulate their understanding and thus reveal gaps in those understandings (Perner, 1991). More generally, while surveys are useful for telling us the prevalence of particular views, they do not reveal much about why people hold these views (Wolf & Moser, 2011), nor do they necessarily allow for specific contexts to be considered (Mason, 2017). For example, in a Chinese closed questionnaire study (Boyes, Stanisstree, & Yongling, 2008) reported concern was very high while two other Chinese studies using qualitative methods (Sternäng & Lundholm, 2011, 2012) painted a more nuanced picture. When faced with an either/or scenario, participants often prioritized economic development over preserving nature (Sternäng & Lundholm, 2012), suggesting that concern about climate change is situated in context rather than being stable. This is in line with findings from studies with adults (Smith & Joffe, 2013).

4.4 | Implications for future research

Future studies in this area could provide greater definitional clarity about the nature of the public “perceptions” that they are reporting. The main focus of the studies included in this review was the accuracy of participants’ knowledge about climate change. It would be worthwhile for future research to explore how children and adolescents

conceptualize climate change more broadly, given that climate change beliefs are known to relate to: worldview and environmental values (Hornsey et al., 2016); economics and infrastructure (Gifford et al., 2011); efficacy beliefs and parental influence (Mead et al., 2012); and emotions (Ojala, 2012a, 2016). Such research should employ a variety of methods, both quantitative and qualitative, to elicit the broadest understanding of factors in addition to knowledge. This should be at the individual, collective (the potential role of the climate strikes and identification with that movement), and situational levels as all of these impact adolescents' climate-related concepts. The use of open-ended questions would be valuable in accessing the views of this group without limiting their responses. Using reverse coding rather than questions with negations would be a useful strategy to address cognitive limitations in younger children.

The differences in reported belief, concern, and willingness to take action by place and age of participant found here warrants further investigation. International studies and studies conducted outside of high income countries would enhance understanding of these differences and where relevant, cross-cultural differences in relation to methodology (Lee et al., 2002) should be taken into consideration. The differences observed in relation to age should also be examined further. Research exploring possible explanations for age differences would be useful in informing future policy and practice in relation to engaging children of different ages with the issue of climate change. Longitudinal studies would add valuable insight and facilitate an understanding of changes to climate change perceptions over time. Comparative studies could explore how adolescents' perceptions of climate change may differ from adults'.

Finally, a clear opportunity exists to study the nascent youth participation in climate action, and its impact on the climate change perceptions and behaviors of children and adolescents. One potential hypothesis could be that participation in the strikes facilitates increased "connectedness to nature," and an acquisition of knowledge about climate change, shown in combination to increase ecological behavior (Otto & Pensini, 2017). A motivation to behave in an ecologically friendly manner is formed in childhood and has the potential to be lifelong, so it is possible that participating in the strikes could have a long-lasting effect on the ecological behavior of this cohort (Evans et al., 2007). This raises the question of whether participating in climate strikes can or should be interpreted itself as ecological behavior at the collective level and whether a relationship may exist in the other direction, with knowledge and connectedness to nature favoring participation in strikes. An interesting direction for future research may address differences regarding predictors of individual versus collective climate engagement of young people and how participation in strikes affects these. An alternative hypothesis could be that participating—or not—in the strikes will serve to entrench existing perceptions and behaviors rather than cause behavioral shift, in line with the polarizing effect of events such as the signing of the Kyoto Protocol on adults in the United States (Capstick et al., 2015).

Future research on youth climate action should consider the ways in which young peoples' involvement in activism is influenced by their peers (Fisher, 2019), and their tendency to communicate about activism via social media rather than more traditional channels (Elliott & Earl, 2018). More informal, "on-the-ground" approaches could bring researchers closer to participants in action, although the challenge of overcoming the ethical issues involved in conducting research with minors must be overcome, particularly that of parental consent. Further, comparative studies would facilitate a comparison between those participating in strikes and those not and longitudinal studies would enable the exploration of changes over time. As such, this review of the literature up until this point in time hopefully serves as a valuable resource to measure whether the climate change social actions already underway changes these perceptions and developmental patterns.

4.5 | Implications for educational policy and practice

There are important implications of this review for education policy and practice. Although it is only one variable, a lack of knowledge does represent an important barrier to engagement on the issue of climate change (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007). If younger children are more accommodating of new scientifically correct models than older children (Kelemen & DiYanni, 2005) and their thinking is less impeded by worldview and cultural values (Stevenson et al., 2014; Tranter & Skrbis, 2014), there may be a case for ensuring that teaching about climate change features early on in school curricula in countries such as the United Kingdom, where this is not currently the case. It should aim to enhance system knowledge—found to be low in these reviewed studies, as well as action and effectiveness knowledge (Frick et al., 2004) which have greater potential to instill climate-friendly behaviors. Educational strategies may also have the ability to address other important factors that are linked to climate-friendly behaviors, such as hope (Monroe et al., 2017).

Future generations of adults will need to appreciate that effective action will require collective engagement at governmental, corporate, and individual levels. This contrasts with aiming to encourage sustainable lifestyles in individual

and domestic situations (Thøgersen & Crompton, 2009), as was the focus of the early 2000s (Defra, 2008). Now that we are seeing the emergence of collective action by young people, there should be a push to understand its role in generating changes to individual practice. A more thorough consideration of the role of collective action might open up opportunities for interventions at this level. The tendency for children in high income and Western nations in particular to endorse small, individual, less effective actions—potentially because they perceive climate change as a global, not local problem—needs to be addressed. This requires understanding what is personally relevant to young people today. One example might be to determine whether young people may be brought “closer” to a spatially and socially distant climate change (Gubler et al., 2019) via social media.

It is important that climate change education makes use of techniques already found to be effective in strategic messaging in education, such as focusing on the personally relevant and using active and engaging teaching methods (Monroe et al., 2017) or using art-based approaches (Ojala & Lakew, 2017). Further work is needed to establish how young children interpret common climate change metaphors used in education (Dijkstra & Goedhart, 2012) and what mode of communication is most effective for children and young people at different stages of development and in different geographical and sociocultural locations.

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CONFLICT OF INTEREST

The authors have declared no conflicts of interest for this article.

AUTHOR CONTRIBUTIONS

Katharine Lee: Conceptualization; methodology; writing-original draft. **Nathalia Gjersoe:** Formal analysis; resources; writing-review and editing. **Saffron O'Neill:** Conceptualization; supervision; writing-review and editing. **Julie Barnett:** Conceptualization; supervision; writing-review and editing.

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APPENDIX DATA EXTRACTION

Author (year)	Country	No. of participants	Age of participants	Gender of participants	Design	Area of focus	Quality control	No.
Boyes et al. (2014)	International	12,627	11–15	51% male, 49% female	Quantitative cross-sectional questionnaire	Belief, concern, solution	M	20
Boyes, Skamp, and Stanisstreet (2008); Boyes, Stanisstreet, and Yongling (2008)	Australia	500	Years 7–10 (12–15?)	Not clear	Quantitative cross-sectional questionnaire	Belief, concern, solution	M	21
Boyes and Stanisstreet (2012)	UK	961	11–16	52% male, 48% female	Quantitative cross-sectional closed questionnaire design	Belief, concern, solution	L	22
Malandrakis, Boyes, and Stanisstreet (2011)	Greece	1,444	12–16	52% male, 48% female	Quantitative cross-sectional questionnaire design	Belief, concern, solution	M	23
Stevenson, Peterson, and Bondell (2016); Stevenson, Peterson, and Bradshaw (2016)	USA	369 (24 teachers)	11–15	45% male, 55% female	Quantitative cross-sectional questionnaire design	Belief, concern, impact	H	24
Chhokar et al. (2011)	India	768	11–16	58% male, 42% female	Quantitative cross-sectional questionnaire design	Belief, concern, solution	M	25
Ambusaidi et al. (2012)	Oman	1,532	Grades 6–12 (11–18?)	48% male, 52% female	Quantitative cross-sectional questionnaire design	Belief, concern, solution	L	26
Stevenson et al. (2014)	USA	387	11–15	45% male, 55% female	Quantitative cross-sectional questionnaire design	Belief	H	27
Tranter and Skrbis (2014)	Australia	3,139	16–17	Not clear	Quantitative cross-sectional questionnaire design	Belief, concern	L	28
Chhokar et al. (2012)	India	268	Grade 12 (17–18?)	54% male, 46% female	Quantitative cross-sectional questionnaire design	Belief, concern, solution	M	29

(Continues)

Author (year)	Country	No. of participants	Age of participants	Gender of participants	Design	Area of focus	Quality control	No.
Devine-Wright, and Fleming (2004)	UK	82 Woodcraft children, 59 comparative and 57 Woodcraft adults	9–12	30 boys and 29 girls in comparative group. Gender split in Woodcraft group unclear	Quantitative comparative questionnaire design	Belief, solution	H	30
Stevenson, Peterson, and Bondell (2016); Stevenson, Peterson, and Bradshaw (2016)	USA	426	11–15	44% male, 56% female	Quantitative cross-sectional questionnaire design	Belief, concern	H	31
Skamp, Boyes, and Stannistreet (2009)	Australia	368	Grade 6 (238); Grade 7 (130)	Not clear	Quantitative cross-sectional questionnaire design	Solution	M	32
Boyes, Skamp, and Stanisstreet (2008); Boyes, Stanisstreet, and Yongling (2008)	China	676	11–16	335 males and 337 females (4 N/A)	Quantitative cross-sectional closed questionnaire	Concern, solution	M	33
Prudente, Aguja, and Anito (2015)	Philippines	600 Children (and 157 adults)	300 grade school, 300 high school	Not clear	Quantitative cross-sectional questionnaire design	Concern, cause	M	34
Line, Chatterjee, and Lyons (2010)	UK	47	11–18	11s 6M, 9F; 15s 9M, 8F; 18s 9M, 6F	Qualitative comparative mixed methods (discussion groups, photo elicitation)	Concern, solution	L	35
Hermans and Korhonen (2017)	Finland	549	Ninth graders	298 boys; 249 girls	Quantitative cross-sectional questionnaire	Concern, impact, solution	H	36
Jackson and Pang (2017)	Hong Kong	1,383 (survey); 34 (interviews)	Grades 7–12	Half boys, half girls	Quantitative cross-sectional questionnaire; qualitative interviews	Impact, solution	M	37
Taber and Taylor (2009)	Australia	29	10–11	22 males, 7 females	Mixed methods pre- and post-intervention design (pre = closed quant questionnaire only)	Cause, solution	L	38
Lee, Lester, and Ma (2007)	USA	405	10–11	204 males and 201 females	Quantitative pre- and post-intervention open-ended writing prompt	Cause, impact, solution	H	39

(Continues)

Author (Year)	Country	No. of participants	Age of participants	Gender of participants	Design	Area of focus	Quality control	No.
Mason and Santi (1998)	Italy	22	10–11	50% male, 50% female	Mixed methods pre- and post-intervention interviews	Cause, impact, solution	M	40
Hestness, McGinnis, and Breslyn (2016)	USA	39	Grade 6	Not clear	Qualitative case study	Cause, impact, solution	M	41
Pruneau et al. (2003)	Canada	39	13–14	Not clear	Quantitative pre- and post-intervention design with interviews	Cause, impact, solution	H	42
Karpudewan, Roth, and Chandrakasan (2015)	Malaysia	73	16–17	42 boys, 31 girls	Mixed methods quasi-experimental intervention survey and interviews	Cause, impact, solution	H	43
Shepardson et al. (2009)	USA	91	Grade 7	54% male, 46% female	Mixed methods open-response questionnaire and draw and explain task	Cause, impact, solution	H	44
Chang and Pascua (2016)	Singapore	27	14–15	Not clear	Qualitative cross-sectional paired interviews	Cause	L	45
Boyes, Chuckran, and Stanistreet (1993)	USA	702	Grades 5–10	50% male, 50% female	Quantitative cross-sectional questionnaire design	Cause, impact, solution	M	46
Puttick et al. (2015)	USA	483	8–14	All girls (girl scouts)	Quantitative pre- and post-intervention questionnaire (qual methods used post)	Cause, solution	M	47
Punter, Ochoando-Pardo, and Garcia (2011)	Spain	379	12–16	194 boys and 171 girls	Quantitative cross-sectional open and closed questionnaire	Cause, impact, solution	M	48
Shepardson et al. (2011)	USA	51	39 junior high, 12 high school	54% male, 46% female	Qualitative cross-sectional open-response questionnaire and draw and explain task	Cause, impact, solution	M	49
Andersson and Wallin (2000)	Sweden	727	15–19	Not clear	Quantitative cross-sectional open-ended questionnaire design	Cause, solution	M	50

(Continues)

Author (year)	Country	No. of participants	Age of participants	Gender of participants	Design	Area of focus	Quality control	No.
Boyes and Stanisstreet (1997)	UK	1,637	14–15	45% male, 55% female	Quantitative cross-sectional questionnaire design	Cause	L	51
Kilinc, Stanisstreet, and Boyes (2008)	Turkey	Not stated (Y10 from 2 secondary schools)	15–16	Not clear	Quantitative cross-sectional questionnaire design	Cause, impact, solution	L	52
Varma and Linn (2012)	USA	196	Sixth graders	98 males, 92 females	Quantitative pre- and post-intervention open-ended questionnaire	Cause	H	53
Dawson (2015)	Australia	438	14–15	189 males, 249 females	Quantitative cross-sectional (questionnaire and interviews)	Cause	H	54
Özdemir et al. (2014)	Turkey	646	Seventh graders	324 males, 289 girls, 33 unspecified gender	Quantitative cross-sectional open and closed questionnaire design	Cause, solution	H	55
Garg and Lal (2013)	India	290	12–19	Not clear	Quantitative cross-sectional questionnaire design	Cause, impact, solution	M	56
Boyes and Stanisstreet (1993)	UK	861	11–16	48% male, 52% female	Quantitative cross-sectional questionnaire design	Cause, impact, solution	M	57
Koulaidis and Christidou (1999)	Greece	40	11–12	22 boys, 18 girls	Quantitative cross-sectional semi-structured interviews	Cause	M	58
Frappart et al. (2016)	France	60 Children (20 over 18s)	Seventh graders, ninth graders, 11/12 graders	Grade 7 10M/10F; Grade 9 7M/13F; Grade 11/12 2M/18F	Quantitative cross-sectional questionnaire design	Cause, impact, solution	H	59
Scott-Parker and Kumar (2018)	Fiji	30	14–18	15 boys; 15 girls	Qualitative focus groups	Cause, impact, solution	M	60

(Continues)

Author (Year)	Country	No. of participants	Age of participants	Gender of participants	Design	Area of focus	Quality control	No.
Dogru and Sarac (2013)	Turkey	362	10–16	Not clear	Mixed methods cross-sectional interviews	Impact	H	61
Daniel, Stanisstreet, and Boyes (2004)	UK	582	11–16	Not clear	Quantitative cross-sectional questionnaire design	Solution	M	62
Francis et al. (1993)	UK	563	8–11	Not clear	Quantitative cross-sectional questionnaire design	Solution	L	63
Skamp, Boyes, and Stanisstreet (2013)	Australia and UK	785 in UK, 500 in Australia (1285)	Years 7–10 (12–15?)	Not clear	Quantitative cross-sectional questionnaire	Solution	M	64
Bofferding and Klooser (2015)	USA	387	11–14 (162) and 14–18 (225)	Not clear	Quantitative pre and post intervention questionnaire	Solution	H	65
Kirk (2008)	New Zealand	31	9–11	Not clear	Qualitative cross-sectional focus groups	Solution	L	66
Sternäng and Lundholm (2011)	China	9	14	4 boys, 5 girls	Qualitative cross-sectional group interviews	Solution	M	67
Sternäng and Lundholm (2012)	China	12	15–16	Not clear	Qualitative cross-sectional role play exercises and longitudinal interviews	Solution	M	68
Byrne et al. (2014)	Sweden and UK	72 in UK, 99 in Sweden (171)	9–10	Not clear	Qualitative cross-sectional discussion groups	Solution	M	69
Wilks and Harris (2016)	Australia	311	12–18	44% male, 56% female	Quantitative cross-sectional closed questionnaire design	Solution	H	70

Linking Text

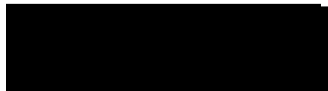
Chapter 3 presented a systematic narrative review of studies exploring children and adolescents' perceptions of climate change. The review found that the majority of the included studies used quantitative methods, in particular closed-form surveys. Most studies examined the extent to which participants' knowledge was scientifically correct and their stated willingness to support particular actions to mitigate climate change. The review found that participants in the UK expressed less concern about climate change and lower levels of willingness to support actions to mitigate climate change than participants in other countries.

The review demonstrated that quantitative methods, overwhelmingly the strategy of choice in the literature thus far, prescribe the focus of inquiry and specify potential responses. Accordingly, Study 1 took a different approach by seeking to understand what aspects of climate change are most readily available to adolescents when they are not prompted to focus on a particular facet of it. The aim of Study 1 therefore, was to capture adolescents' unconstrained responses to the concept of climate change. The study used the free association method to elicit the imagery that adolescents associated with climate change. Social Representation Theory was used to frame the study, which focused on the content and potential structure of adolescents' representations of climate change.

Post-viva notes to accompany this draft manuscript

- a) First image associations and all associations were studied in line with the rank-frequency method outlined by Verges (1994), whereby elicitation made frequently first and frequently (all) are hypothesised likely core components of a representation (Dany, Urdapilleta, & Monaco, 2015).
- b) Valence data for images were collected but not analysed due to the fact that there was frequently little variability in within-individual valence
- c) The MDS figures were created by first inputting the number of times each of the top 10 categories co-occurred into two Excel spreadsheets (one for each age group). These data were transported into SPSS and an MDS analysis run. The program calculates the relative 'distance' (i.e. co-occurrence) between each category in the context of the entire dataset. Consequently, categories that co-occurred frequently will be represented as closer together on the MDS plot, and categories that co-occurred infrequently will be represented as further apart on the plot. The plots represent conceptual distance as spatial distance.

Statement of Authorship

This declaration concerns the article entitled:			
Adolescents' Social Representations of Climate Change: A free association study			
Publication status (tick one)			
Draft manuscript	<input checked="" type="checkbox"/>	Submitted	<input type="checkbox"/>
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Copyright status (tick the appropriate statement)			
I hold the copyright for this material	<input type="checkbox"/>	Copyright is retained by the publisher, but I have been given permission to replicate the material here	<input type="checkbox"/>
Candidate's contribution to the paper (provide details, and also indicate as a percentage)	<p>The candidate predominantly executed the...</p> <p>Formulation of ideas: KL predominantly executed (90%) with help from JB.</p> <p>Design of methodology: KL predominantly executed (90%) with support from JB.</p> <p>Experimental work: KL predominantly executed (90%) the data analysis with support from JB.</p> <p>Presentation of data in journal format: KL predominantly executed (85%), with input from SO'N and JB.</p>		
Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.		
Signed			Date 01/12/20

4 Adolescents' Social Representations of Climate Change: A free association study

Abstract

This study employs a social representations approach to explore the potential structure and processes of UK adolescents' social representations of climate change. 384 pupils in year groups 7 to 10 (aged 11-15) took part in a free association task, writing down the first, second and third image they thought of in response to 'climate change'. An inductive content analysis was conducted, with all responses grouped into 23 categories, almost all of which related to impacts of climate change. To examine potential differences between participants in year groups 7/8 and 9/10, further analyses of the top 10 categories' content and the relationship between the categories were conducted. Responses relating to increasing heat, melting ice and weather were most common and a number of responses contained images of disaster and destruction. The older adolescents appeared to hold more complex and specific representations of climate change than the younger. Comparisons are drawn between our findings and previous work with adolescents and adults, and avenues for future research are suggested.

4.1 Introduction

Climate scientists are almost unanimously agreed that the climate is changing, that climate change is anthropogenic, and that it presents potentially insurmountable challenges to the planet and all of its occupants (Oreskes, 2018). Some countries are already experiencing the human and financial costs of some of the impacts of climate change (Eckstein, Hutfuls, & Winges, 2019). In the UK – where this study was conducted – climate change impacts may feel less tangible but a trend for warmer winters and hotter summers, rising sea levels and probable changes in rainfall patterns changing are already a reality (Committee on Climate Change, 2017). Perhaps due to the perception that climate change is a distant phenomenon (Spence, Poortinga, & Pidgeon, 2012), the UK public's attitudes towards climate change have been somewhat ambivalent historically. Although levels of concern increased quite substantially from 2017 to 2019 (Eurobarometer 2019), they remain lower than the EU average. UK citizens are more likely to perceive flooding and wet weather events as threats than increasing temperatures which can be perceived positively (Taylor, Dessai, & Bruine de Bruin, 2017). Given the scope and scale of the challenges that climate change will pose to the planet and its occupants in the next decades (IPCC, 2018), it is vital that the ways in which the next generation of adults think and feel about the issue is understood, in order that they are equipped to deal with the challenges they will be faced with. To date however, a large proportion of the academic literature relating to understandings of climate change focuses on adults (e.g., Lorenzoni, Leiserowitz, de Franca Doria, Poortinga, & Pidgeon, 2006; Weber, 2010) or young adults (e.g., Corner et al., 2015; Hibberd & Nguyen, 2013). To address this omission, this paper sets out to explore how adolescents in the UK make sense of climate change.

Of the many approaches taken to explore the public's engagement with climate change, Social Representation Theory (SRT) (Moscovici, 1961) is one that facilitates an understanding of how the public make sense of the issue. Social representations are shared values, beliefs and practices about particular objects that arise from interaction between individuals, groups and institutions. SRT explicates how the unfamiliar and scientific is transformed into the familiar and common-sense and as such, it lacks the evaluative element that pervades the attitudes approach (Joffe, 2003) because its focus is sense-making in and of itself, rather than the 'accuracy' of that sense-making. It also eschews its individualistic focus as social representations are interpersonal and intergroup rather than intrapersonal. They exist across minds, are malleable and inextricably linked to time and place (De Rosa, 1993). People assimilate symbols, images and metaphors from their social context to inform the meanings they imbue issues with. Accordingly, in his seminal study about psychoanalysis (Moscovici, 1961), contrasting representations developed as different groups assimilated or rejected the particular elements of psychoanalysis that 'fit' into their own social groupings, enabling group members to orient the issue and to communicate with one another about it.

Social representations of scientific issues such as climate change are considered to be strongly influenced by the media's presentation of that issue (Smith & Joffe, 2009), which perhaps gives – or has historically given – a non-scientific perspective equal weight to a scientific one (Boykoff, 2007). Media imagery is considered particularly influential in shaping representations because images encompass and position an issue so succinctly and wholly that they concretise it, and exert a 'positioning power' over it (Joffe, 2008), such that the visual becomes an expression of common sense thought. In relation to climate change, there are a range of possible and contrasting representations that one can be aware of, and potentially subscribe to. For example, that it is anthropogenic, natural, or both natural and anthropogenic (Höijer, 2010; Olausson, 2010).

A social representation is both an action and an entity; a process through which a representation comes to be and a structural object. Processes of social representation centre on the concepts of anchoring and objectification (Moscovici, 1990). Through anchoring, new concepts are related to more familiar concepts so that they may be understood. Historically, the concept of climate change has been anchored to that of the diminishing ozone layer, an already familiar environmental concept (Jaspal, Nerlich, & Cinnirella, 2014). Through objectification, the abstract is made concrete, often via the use of iconic imagery. Objectification of climate change in the media frequently takes the form of the forlorn polar bear sitting on melting ice (Wibeck, 2014) or of smokestacks silhouetted against the sky (O'Neill & Smith, 2014). The structure of a social representation is conceptualised by Abric (1993) as constituting central and peripheral elements. The central core contains a small number of stable and consensual elements that are suggested to be relatively independent of context. The periphery is constituted of a greater number of more flexible elements that may vary across groups, they refer to individual experience and are context dependent. According to Abric (2001) the dual system performs two functions; to manage the meanings associated with an object and strengthen them (the core) and to protect the core with contextualised and conditional elements (the periphery). It is through the peripheral system that new information may be integrated, and peripheral changes may lead to transformation of a representation if peripheral elements become core elements. The function of and relationship between these two components may explain why social representations can be simultaneously stable and consensual, and varied.

Whilst comprising a relatively small proportion of the body of academic work on the issue, some scholars have utilised a social representation framework in relation to public (adult) understandings of climate change. This has resulted in the proposition that sense-making around climate change is underpinned by dichotomies – such as the self and the other, naturalness and unnaturalness and certainty and uncertainty (Smith & Joffe, 2013). These antinomies offer potential identity protection because they enable the problem to be located elsewhere, with others, or cast a shadow of doubt over the authenticity of climate change.

Representations of climate change have been shown to be linked to the visual iconography of climate change (Doyle, 2007), such as melting glaciers and displaced polar bears (Moloney et al., 2014).

To our knowledge, SRT has not been deployed in relation to adolescent understandings of climate change. Rather, most of this literature resides within the knowledge-deficit framework (e.g., Ambusaidi, Boyes, Stanisstreet, & Taylor, 2012; Daniel, Stanisstreet, & Boyes, 2004), comparing adolescents' knowledge with scientific facts about climate change. Invariably, this approach finds participants wanting in that they, like adults, have patchy knowledge about the causes and impacts of and solutions to climate change, conflate environmental issues (Wilks & Harris, 2016) and hold misconceptions (Boyes, Stanisstreet, & Yongling, 2008). Studies employing a Social Representations framework to investigate young peoples' understandings of scientific and social issues have demonstrated its utility in revealing more than simply a presence or absence of knowledge, highlighting the function of social representations and their dependence upon context. For example, Zambian adolescents' representations of AIDS (Joffe & Bettega, 2003) were active and identity-protective in that they enabled both responsibility and vulnerability to be placed with others. Differences in cross-cultural representations of the public sphere (Jovchelovitch, Priego-Hernández, & Glăveanu, 2013) were strongly related to the extent to which that culture was individualist or collectivist, underlining the way in which representations reflect the particular culture in which they are produced.

This study uses a social representations approach to explore UK secondary school pupils' understandings of climate change. It might be expected that adolescents' representations of climate change would be aligned with their parents' (Mead et al., 2012). That said, there are reasons why their representations might diverge. First, because the term 'climate change' has existed in the lexicon for as long as they will remember (IPCC, 2019), as have circulating social representations of climate change. Also, because climate change has a place on the secondary school curriculum in both Geography and Science, adolescents will therefore be exposed to social representations of climate change shared in the school setting. Climate change is not explicitly on the national curriculum in England and Wales for children of primary school age (up to aged 11), although individual schools may choose to incorporate climate change into their teaching. Deciphering the curriculum for Key Stage 3 Geography and Science (Academic years seven to nine, ages 11-14) is difficult because there is little specificity about what should be taught and when (Department for Education, 2013). Potential content is couched in rather opaque terminology that is open to interpretation, such as "how human and physical processes interact to influence, and change landscapes, environments and the climate; and how human activity relies on the effective functioning of natural landscapes" (Department for Education, 2013). To further complicate matters, nearly three quarters of UK state secondary schools are now academies (National Audit Office, 2018), who are not formally obliged to follow the national

curriculum until GCSE teaching begins. Many schools now truncate Key Stage 3 teaching into two rather than three years (year groups seven and eight rather than seven to nine), in order to begin teaching the now more challenging GCSE content a year earlier (National Foundation for Educational Research, 2019). It is possible to conclude therefore that formal climate change teaching would likely take place in year group nine but may or may not be taught prior to this.

This study uses the free association method (Szalay & Deese, 1978) to elicit the imagery that adolescents associate with climate change and to explore potential social representational processes and structures. Free association tasks are said to access spontaneous and unconstrained thoughts about a particular object (Peters & Slovic, 1996). Their content can inform us about processes of social representation, and analysis of the frequency and ranking of associations about their potential structure (Lo Monaco, Piermatteo, Rateau, & Tavani, 2017). Free associations have been used to investigate young people's social representations of a variety of objects, such as children's rights (Molinari, 2001) and disability (Harma, Gombert, & Roussey, 2013). They have also been utilised with adults in relation to climate change within a social representations framework (Moloney et al., 2014; Smith & Joffe, 2013).

Our research questions are:

- 1) What images do adolescents associate with climate change?
- 2) What are the contents of these images?
- 3) How do these images relate to one another?

4.2 Method

4.2.1 Design

The study employed a qualitative cross-sectional word association design. The study received ethical approval from the University of Bath in October 2017.

4.2.2 Participants

Participants were pupils in year groups seven, eight, nine and 10 (aged 11-15), recruited from a large, mixed-sex secondary Academy school located in a small town in the South West of England with 1356 pupils enrolled at the time of data collection. The school follows the national curriculum, with a specific climate change topic taught in year nine in Geography. Pupils are likely to learn about climate change in Science concurrently. The school population is likely more socially advantaged than the UK average, as relatively few pupils are eligible for free school meals and English is the first language for most pupils. The school was most recently rated 'Good', out of four possible grades; Excellent, Good, Requires Improvement and Inadequate (Gov.UK, 2019).

A total of 384 pupils took part in the study. Thirty-eight participants' data were deleted because their responses were either illegible or blank, leaving a total of 346 participants. A breakdown of the number of participants by year group and gender is detailed in Table 1 below.

Table 1. Breakdown of participants by age and gender

Year group	Male	Female	Prefer not to say	Total
7 (ages 11-12)	62	58	4	124
8 (ages 12-13)	9	13	0	22
9 (ages 13-14)	57	75	7	139
10 (ages 14-15)	30	31	0	61
Total	158	177	11	346

4.2.3 Materials

Each participating Geography teacher was given a briefing and debriefing sheet. This included some information for them and instructions to read out to the class before and after the task. Each participant was given a double-sided sheet of A4 paper. On one side was an information sheet, this outlined the purpose of the study and explained what participants needed to do. On the other side was the task sheet. This asked participants to denote their age, year group and gender. Then to note the first, second and third image that came to mind when they thought of the words 'climate change'.

4.2.4 Procedure

After receiving ethical approval and prior to data collection, the school sent out letters to parents of children in participating year groups that outlined the nature and purpose of the study. Parents were invited to contact the Head of Geography if they wished to withdraw their child(ren) from the study. Data were collected at the start of participating classes' geography lessons over a two-week period during late November and early December 2017. At the start of the class, teachers read out their instruction sheet to participants. Participants read the information sheet and when instructed to, turned the paper over and completed the task. Task sheets were then collected by teachers. At the end of the two-week period, the researcher collected all completed task sheets from the school.

4.2.5 Analysis

Following data collection, data were transcribed into Microsoft Excel. An inductive content analysis was conducted to categorise the images into discrete categories via the process of generating codes, broader codes, and finally image categories. Data were split into two sections, year groups seven and eight and year groups nine and ten, to take account of their exposure to climate change in the curriculum. First, the distribution of images within and across categories for first responses and all responses was made for all participants, then separately for pupils in years seven/eight and nine/ten. A count of categories for first and all responses was made for all participants, then for pupils in years 7/8 and 9/10. Total frequency (how often a category appeared overall) and rank frequency (how often a category appeared first) were calculated. Categories with both high total frequency and high rank frequency were highlighted as those appearing to be the most important to each group, and potential ‘core’ categories (Dany et al., 2015). Second, a within category thematic analysis was conducted on the ten most common categories to explore the category content – the verbatim elicitation and codes that underpinned these categories. Finally, a data matrix calculating how frequently categories co-occurred was created. These data were inputted into SPSS and the top 10 categories were subject to multi-dimensional scaling analysis to ascertain the relationships between image categories. The analysis produces a plot that displays the relationship between the categories, whereby spatial proximity is suggestive of conceptual proximity, in that categories that frequently co-occur are positioned close together and categories that rarely co-occur are more distant.

4.3 Results

The results are organised as follows: First, a description of the key thematic categories and graphs depicting their distribution by age group. Second, to explore category content, an overview of notable within-category code and elicitation observations. Finally, the plots that denote the relationship between image categories for participants in year groups 7/8 and 9/10 are presented.

4.3.1 Category descriptions and frequencies

The inductive content analysis identified 23 unique categories from all elicitation. The number of elicitation in each category, some elicitation examples and their frequency as a proportion of total elicitation is illustrated in table 2 below.

Table 2. Identified categories

Category name	Example elicitation attributed to category	Total no of elicitation	% of total
Heat	“Heat”, “Hotter”, “Sun”	163	14.1
Ice melting	“Ice melting”, “Melting”, “Icecaps melting”	134	11.5

Weather	“Rain”, “Weather”, “Extreme weather”	126	10.9
Animals	“Polar bears”, “Animals”, “Animal death”	115	9.9
Pollution	“CO2”, “Pollution”, “Factory gas”	111	9.6
Disaster	“Destruction”, “Death”, “Danger”	101	8.7
Scientific terms	“Global warming”, “Greenhouse effect”	89	7.7
Sea level rise/flooding	“Rising sea level”, “More flooding”	71	6.1
Nature	“Earth”, “Trees”, “Mountains”	51	4.4
Cold	“Cold”, “Getting colder”	44	3.8
Politics	“Donald Trump”, “Paris climate change agreement”	20	1.7
Named Geographical region	“Antarctica”, “The Arctic”	20	1.7
Temperature	“Different temperature”, “Temperature”	20	1.7
Non-earth	“Space”, “Solar system”	18	1.6
Dry/desert	“Desert”, “Dry”, “Drought”	13	1.1
Ambiguous response	A response that could not be categorised elsewhere	12	1.0
Change	“Change”, “Changing”	11	1.0
Affective response	“Sad”, “Sadness”, “No hope”	10	0.9
Human blame	“Our fault”, “Humans to blame”	8	0.7
Don’t know	“Don’t know”	6	0.5
Positive outcomes	“No school”	5	0.4
Environmentally friendly behaviour	“Solar panels”	5	0.4
Unnoticed	“Unseen”	4	0.3

The majority of elicited images fell within the top 10 categories (86.7% of responses), and the top five categories accounted for 56% of all responses. The first response and all response percentages for these top 10 categories for year groups 7/8 and 9/10 are detailed in the figures 1 and 2 below:

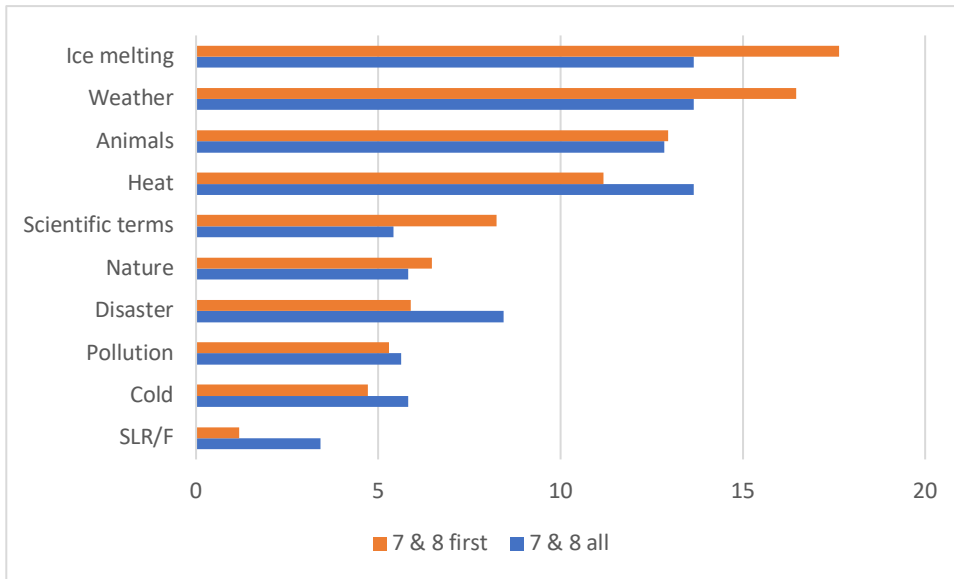


Figure 1. First response and all response categories – year groups 7/8 %

For participants in year groups 7/8, four categories can be considered to be most salient to their representations of climate change. These are ‘Ice melting’, ‘Weather’, ‘Animals’ and ‘Heat’, all of which were frequently produced and frequently produced first.

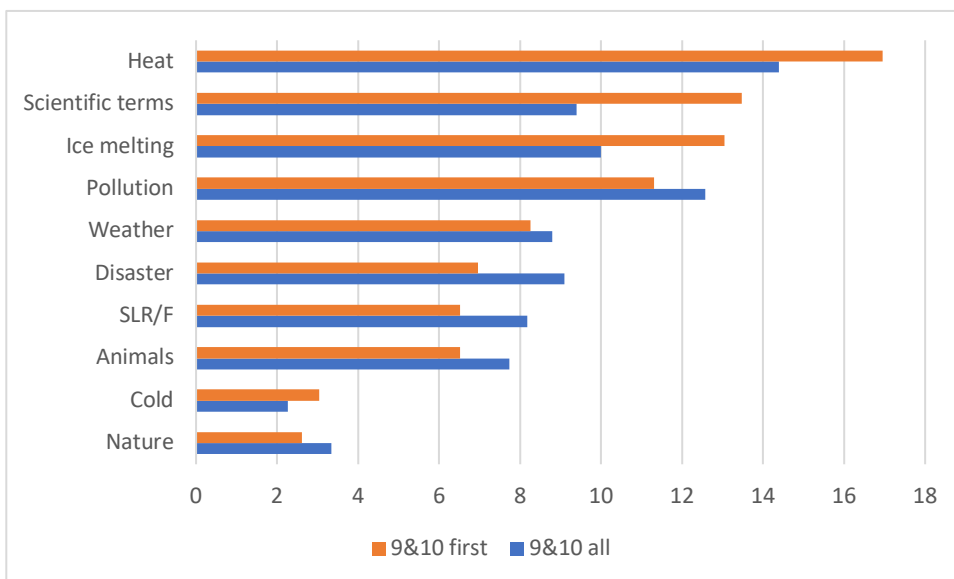


Figure 2. First response and all response categories – year groups 9/10 %

For participants in year groups 9/10, four image categories can be considered to be most salient: ‘Heat’, ‘Scientific Terms’, ‘Ice melting’ and ‘Pollution’, with all appearing frequently and frequently first.

4.3.2 Within category analysis

Potential similarities and differences across the age groups in the content of representations were explored by looking at the codes *within* the image categories. Some categories made up of consistent codes across both year groups, for others there were differences in the constitution of the overall category.

4.3.2.1 Categories made up of consistent codes

Six categories - 'Heat', 'Cold', 'Nature', 'Animals', 'Sea level rise/flooding' and 'Ice melting' - were made up of a small number of self-evident and consistent codes that were the same across age groups. For example, the codes 'heat', 'hotter', 'sun' underpinned 'Heat', 'ice melting', 'melting ice', 'icecaps melting' underpinned 'Ice melting' 'trees', 'environment' and 'landscape' underpinned 'Nature' The category 'Animals' was very heavily dominated by polar bears.

One category - 'Disaster' - contained more codes and more diverse codes than did other categories, although these codes and the individual elicitation underpinning them did not differ by year group. Codes in this category can be defined by their location along a dimension of severity. At the most severe end were the codes 'apocalypse', 'death' and 'destruction', referring to the most catastrophic of outcomes. Images associated with 'apocalypse' were particularly vivid ('end of civilisation', 'humankind at its end'), often incorporating elements of fire or explosion ('sun exploding', 'world on fire'). The code 'Harm to nature' indicated marginally less finality. Elements of fire were invoked ('rainforest burning'). 'Harm to humans' also featured, with a focus on injury to physical health ('breathing issues'). 'Harm to society more broadly' was touched upon by only very few participants, with elicitation such as 'poverty', 'no food' and 'poor quality of life'. Another common code within this category was 'seismic events' ('earthquakes', 'tsunamis'). This code indicated harm from damaging events and typically referred to the types of events not observed in the UK.

4.3.2.2 Categories that contained differences in codes by year group

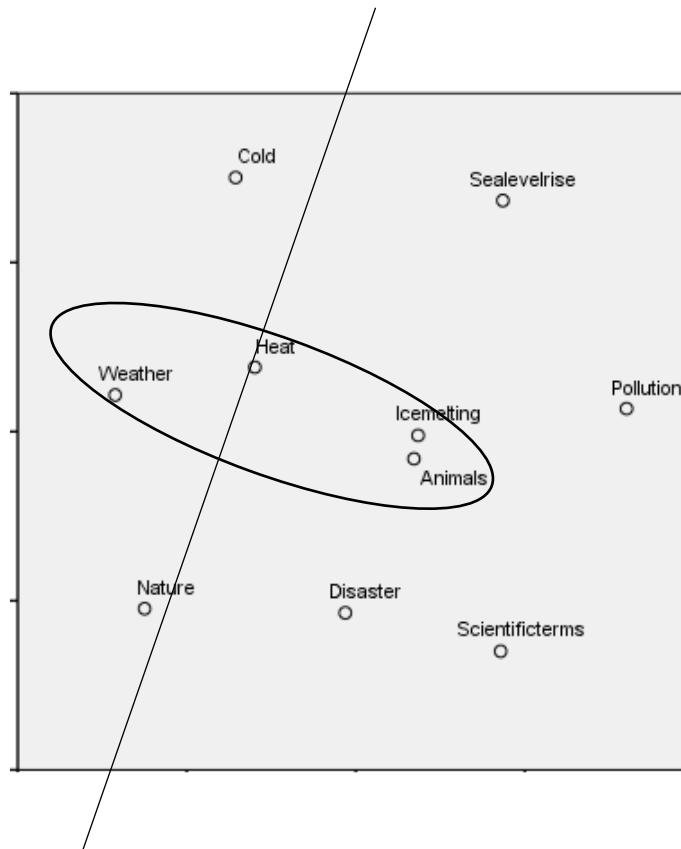
The codes within the categories 'Weather', 'Pollution' and 'Scientific terms' evidenced some differences between the two age groups. For example, in relation to 'Weather', images produced by pupils in year groups 7/8 more frequently related to 'types of weather' such as rain, whereas those in year groups 9/10 more frequently related to 'extreme weather'. Common codes within 'Pollution' for all year groups were 'pollution', 'factory pollution' and 'car pollution'. However, pupils in year groups 9/10 more frequently identified specific pollutants such as 'CO₂' and the origin of such pollutants, such as 'fossil fuels'. Common codes across year groups within 'Scientific terms' were 'global warming' and 'greenhouse effect'. However, use of the term 'greenhouse gas' was used almost exclusively by those in

year groups 9/10 and the word ‘enhanced’ added to ‘greenhouse effect’ was again only used by those in these year groups.

4.3.3 Relationship between image categories

The previous two sections have focused on the individual image category frequencies and their contents. This final section focuses on the relationship *between* the 10 most common image categories. The plots (figures 3 and 4, below) are produced by a multidimensional scaling (MDS) technique and illustrate the relationship between image categories for participants in the two-year groups. The stress for both of the two-dimensional plots was 0.05, meaning these solutions are a ‘good’ fit (Kruskal, 1964).

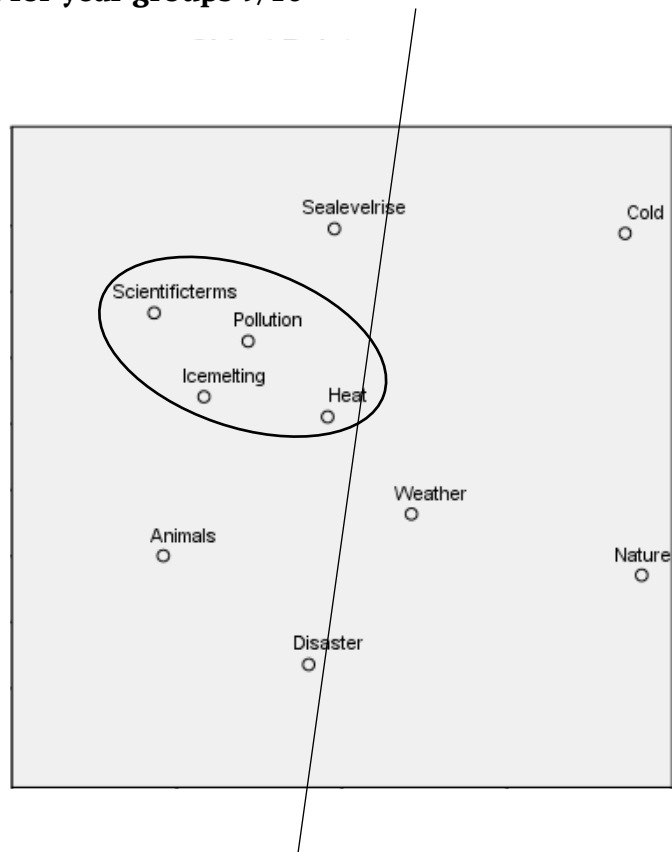
Figure 3. MDS plot for year groups 7/8



The minimal distance between the categories ‘Ice melting’ and ‘Animals’ reflects the very frequent co-occurrence of these categories; for many participants in years 7/8, melting ice and animals (polar bears) ‘went together’. The horizontal dimension of the plot could be understood in terms of more directly experienced or tangible image categories to the left of the diagonal line and less directly experienced or abstract image categories to the right. Those image categories on the right of the line are also those more often associated with climate change in

the media or in textbooks, such as imagery of smokestacks or polar bears, and references to scientific terminology and sea level rise. The potential ‘core’ categories for this group span both sides of the diagonal line, including more and less directly experienced categories.

Figure 4. MDS plot for year groups 9/10



The closest two points in Figure 4 are ‘Pollution’ and ‘Ice melting’, which indicates that these two items occurred together most frequently. This suggests that for year groups 9/10, melting ice – an impact of climate change – is often considered alongside causes of climate change (pollution). The horizontal dimension could be understood in much the same way as the plot for year groups 7/8. More directly experienced or tangible image categories are to the right of the line and less directly experienced or abstract image categories to the left. These image categories to the left of the line are those that might be associated with climate change in the media or in textbooks; scientific terminology such as ‘global warming’ and images of animals, melting ice and smokestacks. The potential ‘core’ categories for this group sit to the left of the line and are comprised of categories that are less directly experienceable.

4.4 Discussion

The aim of this study was to identify the image categories that adolescents associate with climate change and to explore what these might infer about the processes and structure of their social representations of climate change. A total of 23 image categories were identified, the top 10 of which accounted for nearly 90% of all responses. There was, therefore, considerable consensus in relation to the image categories chosen to depict climate change.

4.4.1 Images of climate change

Overwhelmingly, the images related to the consequences of climate change rather than to causes and solutions. This suggests that adolescents, like adults (e.g., Moloney et al., 2014), tend to represent climate change in relation to its impacts. There were differences in the relative dominance of image categories for participants in the different year groups. For participants in year groups 7/8, the dominant categories were '*Ice melting*', '*Weather*', '*Animals*' and '*Heat*'. These four image categories appeared frequently and frequently first, suggesting they are most important to this group's representations of climate change. For them therefore, climate change seems to be mainly considered in terms of increasing temperatures, melting ice and displaced or threatened polar bears. Also important was weather, with climate change anchored to weather, in particular specific types of weather, such as rain.

For participants in year groups 9/10, the most dominant image categories were '*Heat*', '*Scientific terms*', '*Ice melting*' and '*Pollution*', all of which appeared frequently and frequently first. Thus, this age group appear to have integrated more scientific terminology such as '*greenhouse effect*' and '*global warming*' and causes into their representations, likely a reflection of climate change teaching in school. Thus, they seem more disposed to relate climate change to more abstract concepts and terminology.

4.4.2 Content of image categories

A number of categories were underpinned by remarkable consistency in produced images that did not differ by year group. This is perhaps not surprising, given that certain categories are self-evident – '*Ice melting*' relates to melting ice – differences were only observed in terms of specificity (e.g., the use of the term ice cap rather than ice). Where a specific animal was stated in the category '*Animals*', it was almost exclusively the polar bear, indicating that this animal concretises the issue of climate change for many. However, we do not know what meaning these participants attached to the polar bear. Whilst it might seem reasonable to assume the use here was benign and the polar bear deemed a sympathetic figure, research has shown that the polar bear can be a polarising figure for many adults (Chapman, Corner, Webster, & Markowitz, 2016), associated with fatigue and cynicism rather than with concern. The category '*Disaster*' contained a number of codes that did

not differ by year group. Here, there was evidence of participants anchoring climate change to concepts or imagery derived from science fiction. Apocalyptic outcomes, death and devastation featured notions of fire, explosions and the end of the human race. Many of these are extreme and improbable and may serve to obscure the more likely consequences of climate change, such as migration, flooding, and food and water shortages.

The categories that contained differences in codes by year group may illuminate the changes that seem to occur in relation to the important or core categories between participants in year groups 7/8 and 9/10. In '*Weather*', participants in year groups 7/8 refer almost exclusively to types of weather such as rain, likely a reference to direct experience. Participants in year groups 9/10 refer to types of weather but also to changing and extreme weather. As such, this latter group seem to be referring to weather in terms of it being a consequence of climate change, rather than simply equating climate change with the weather. Similarly, within the categories '*Pollution*' and '*Scientific terms*', participants in these year groups demonstrated greater specificity than those in year groups 7/8, adding 'enhanced' to the more ubiquitous 'greenhouse effect' and identifying 'fossil fuels' or 'CO₂' rather than more generic terminology such as 'factory pollution'. In sum, the content of these image categories is suggestive of representations for year groups 9/10 containing greater complexity and specificity.

4.4.3 Relationship between image categories

The MDS plots are a useful way to visualise the relationship between the image categories and the plots for the different year groups are somewhat different. The year group 7/8 plot highlights the close relationship between ice melting and animals for these participants (the iconic polar bear on the melting ice cap) and the relative distance between all of the other categories. This likely reflects both the greater propensity of this group to produce multiple images in the same category (e.g., to state three types of weather rather than items that could be coded into three independent categories) and to produce a greater variety of image categories together. The plot for year groups 9/10 illustrates greater proximity between a number of image categories, with 'Ice melting' and 'Pollution' co-occurring frequently with 'Scientific terms' and 'Heat'. The closest relationship is between '*Ice melting*' and '*Pollution*' suggesting that these year groups are more inclined to link cause and effect.

4.4.4 Processes of representations

In asking participants to reproduce imagery associated with climate change, participants were also being asked to objectify it. In the main, the imagery they produced was not far removed from external climate change imagery often seen in the media (O'Neill, 2013). This would suggest that often seen and iconic climate

change imagery has a bearing on the way that these adolescents represent climate change, this was particularly evident with participants in year groups 7/8. It is also suggestive of climate change being objectified almost entirely in terms of its impacts.

Many participants, those in year groups 7/8 in particular, anchored climate change to the weather. This may be unhelpful if weather is conceived as 'natural' and natural conceived as something that cannot be changed (Bostrom & Lashof, 2004). Some participants in this study also anchored climate change to science fiction disaster. This seems likely born of linking climate change - an issue with known potentially devastating consequences - to the kinds of devastating consequences seen elsewhere, perhaps in video games, at the cinema or on TV. Many of the images produced were dramatic, vivid and high in visual or emotional impact ('burning earth', 'death to humankind') with very little consideration of the more mundane (but arguably much more likely and personally impactful) disastrous consequences of climate change in the UK. Envisaging climate change in this way may serve to protect participants from feeling personally vulnerable in that they are simultaneously demonstrating an acceptance that climate change is 'disastrous' and minimising the personal elements of that disaster.

4.4.5 Structure of representations

Whilst the procedure here does not enable us to confirm the structure of participants' representations, we can conclude that the elements that had high rank and total frequency are of particular importance and may be deemed 'core' elements. Based on these, and the positioning of items on the common space plots we can conclude that there appear to be some changes to each group's important elements and that representations do, as Moscovici (1961) suggested have a capacity for change. If two representations are different because elements of their core are different (Abric, 2001), and representations are only the same if the core is the same, then the findings here are suggestive of representations changing quite substantially between year groups 7/8 and 9/10. Abric (2001) argues that core elements are more stable, resistant to change and independent of context whilst peripheral elements are more flexible and context-dependent, these peripheral elements adapting to preserve a stable core. The findings here do not support the idea of a stable core given the fairly substantial change between the core categories for participants in year groups 7/8 and those in 9/10. There is a lacuna of literature relating to the structure of young people's social representations of climate change and an avenue worthy of investigation.

4.4.6 Psychological distance

The image categories were suggestive of participants viewing climate change as a psychologically distant phenomenon (Trope & Liberman, 2010), as can be the case

for adults in the UK (Spence et al., 2012). Categories related in the main to events happening far away (e.g. melting ice caps) rather than to participants' local and everyday lives. Representing climate change as an issue affecting faraway places may be problematic if distance equates to a reduction in salience or issue avoidance (O'Neill & Nicholson-Cole, 2009). Evidence of participants viewing climate change as socially distant can also be observed in the codes within the one category directly relating to causes of climate change – pollution. By far the majority of codes related to industry pollution and car pollution rather than pollution originating from participants' own homes or lifestyles. More personal behaviour such as car and air travel, home energy consumption or meat production were notably absent from participants' responses. This may indicate that participants view others rather than themselves as polluters. Further, the terminology used within the categories 'pollution' and 'scientific terms' (e.g., carbon dioxide, greenhouse gas) are psychologically distant in that they are particularly abstract and impersonal.

4.4.7 Comparing findings with literature relating to young people and climate change

The findings here both concur with and contradict findings from other studies about climate change with young participants. In common was the association of climate change with impacts to 'wild' animals and nature rather than domesticated or agricultural (Shepardson, Niyogi, Choi, & Charusombat, 2009). Broader socio-economic impacts such as migration were not common here, as in other studies (e.g., Punter, Ochando-Pardo, & Garcia, 2011). The focus of many historic studies in this area are solutions to climate change – where questions were posed to young people about solutions to climate change (Bofferding & Kloser, 2014; Boyes et al., 2014). Thus, a particular focus will lead to a particular output, particular questions to particular answers. In this study, where the participants were not directed to solutions, they did not focus on them, only one very small category relating to solutions was identified and the vast majority of image categories related to impacts.

4.4.8 Comparing findings with adult climate change literature

These adolescents' representations appear to mirror adults' to some degree. Adults also tend to focus on the impacts of climate change, rather than causes or solutions (e.g., Moloney et al., 2014). Representing climate change as a spatially distant phenomenon is common to both the adolescents here and to adults in the UK (Smith & Joffe, 2013) and adults in Australia (Moloney et al., 2014). Viewing climate change as socially distant, in particular considering that it is others' rather than one's own behaviour that pollutes the planet appears present here and in UK adults (Smith & Joffe, 2013). Weather dominated both first and all responses given by UK participants in a word association study (Lorenzoni et al., 2006) which

would suggest that weather was at the core of UK adult's representations of climate change at this time. More recently, weather was the second response given by adults in another word association study (Smith & Joffe, 2013). If viewing climate change in relation to weather is unhelpful because weather is 'natural' and as such something that cannot be countered (Bostrom & Lashof, 2004), then it is perhaps encouraging that here, weather seems to be a less important element for the participants in year groups 9/10. It is also encouraging that there was little evidence of climate change denial or description of climate change as a natural phenomenon, although it may simply have been difficult for participants to imagine an image that represented climate change denial, there were only a small number of elicitations of 'Donald Trump'.

4.4.9 Strengths, limitations and future directions

An important strength of this study is that adolescents' responses to climate change were not pre-prescribed but rather elicited more freely and with minimal researcher input (Peters & Slovic, 1996). The subsequent output contrasts with some of the previous findings from studies with adolescents in that the participants themselves could decide on their focus, demonstrating for example that they did not associate climate change with solutions. We have been able to draw some tentative conclusions about the structure of adolescents' representations of climate change and to explore potential structural differences in older and younger participants' representations. What it does not provide however, is further explanation. We know what participants associate climate change with, but do not know why they do so. We know that older participants appear to integrate a more diverse set of concepts together, but do not understand why, although we can speculate that this relates to exposure to the academic curricula. Asking participants to provide 'images', as opposed to 'thoughts' or 'ideas' may have led them to respond with more overtly visual concepts – such as polar bears – rather than more abstract or cognitive representations.

Decisions about which category to place particular elicitations in could have been made differently by other researchers. For example, we categorised 'global warming' within the category 'scientific terms', because of its specificity and association with the terminology used by scientists and in textbooks. We categorised the elicitation 'extreme weather' within 'weather' rather than 'disaster', because it does not allude to something specific enough to conclude that it would be unambiguously disastrous. Other researchers may have made different decisions about categories and categorisations.

Data for this study were collected in December 2017, prior to the UK's extreme weather in 2018 (extremely cold weather in February and March and a prolonged summer heatwave). Also, and perhaps more importantly, prior to the 'school strike for climate' movement that was started by Greta Thunberg in August 2018. This movement has proliferated, and is ongoing, with around six million across the

world taking action in the week of 20 September 2019 (Taylor, Watts, & Bartlett, 2019). It would be useful to explore the potential ways in which young people may, or may not, incorporate these shorter- and longer-term events into their representations of climate change. It could be hypothesised that the responses in a repeated version of this study might be quite different in the aftermath of the strikes, in that respondents might allude to the strikes themselves, or to the objectives of the strikes, meaning a greater focus on solutions to climate change than was seen here. It could equally be that elicitations would be different for strikers and non-strikers, or that the strikes make relatively little impact at all. This warrants further investigation.

Findings indicate that there is likely a relationship between academic teaching about climate change and adolescents' representations because of the differences in core components between the two year groups. Older participants were more inclined to associate climate change with pollution and scientific terminology – something that might be gleaned from the curricula - and less inclined to associate it with animals and weather. Intuitively, this would seem to reflect what they might be learning from the academic curriculum and is demonstrated in the way that they appear to 'join together' more climate-related concepts and identify more specific scientific terminology. However, becoming more 'knowledgeable' about the science of climate change could perhaps be making their representations rather more psychologically distant, in that they appear to relate to increasingly abstract phenomena. This may be unproductive if making climate change more personally salient involves making it more personally relevant (O'Neill & Nicholson-Cole, 2009). It would seem important therefore to consider incorporating more local and personal elements into the communication of climate change in the national curricula, by linking it to extreme weather events in the UK or to local geographical impacts (Uzzell, 2000), utilising teaching strategies known to be effective in climate change education (Monroe, Plate, Oxarart, Bowers, & Chaves, 2017).

4.5 Conclusion

Through three analyses of word association data, this study has illuminated the way in which 11 – 15-year-old adolescents represent climate change, identifying some differences between the older and younger adolescents. It has shown that the group as a whole tend to represent climate change in terms of its impacts and that these impacts are often psychologically distant. This study has highlighted the utility of more open-ended and less prescriptive methods in giving participants greater autonomy over their potential responses. Participants were able to raise issues that may not arise using other methods, such as surveys. It also demonstrates that some issues that young people are frequently asked about in surveys – such as solutions to climate change - are not necessarily raised of their own volition. Future work could help to develop further understanding of why and

how certain concepts come to underpin adolescents' representations of climate change.

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Linking Text

In Study 1, 11- to 15-year-old adolescents took part in a free association task. The analysis of their responses indicated that overall, climate change was represented much more in terms of its impacts than its causes and solutions. Many of these impacts – such as melting ice caps and homeless polar bears – are situated in distant places rather than the UK, indicating that the participants may view climate change as a psychologically distant phenomenon. Additionally, older adolescents appeared to hold more specific and scientific representations of climate change than younger.

The free association method used in Study 1 facilitated an understanding of the concepts that participants associated with climate change and indicated that they viewed climate change as psychologically distant, but due to the method used, participants' responses were brief and unelaborated. Therefore, the aim of Study 2 was to examine in more depth the extent to which adolescents represent climate change as a psychologically distant or proximal phenomenon across the four key dimensions (temporal, spatial, hypothetical, and social). Picking up again on the findings of the narrative review in Chapter 3, which highlighted that studies almost always use predefined response scales to measure adolescent responses to researchers' questions, Study 2 focused on participants' questions rather than on their answers to the questions of researchers. The use of this method enabled a consideration of the way in which participants focused and elaborated on the facets of climate change that most interested and concerned them. This allowed for the expression of any unexpected aspects of their representations and highlighted the various ways in which they position climate change as proximal or distant.

Statement of Authorship

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Signed			Date 01/12/20

5 ‘Will polar bears melt?’ A qualitative analysis of children’s questions about climate change

Abstract

Climate change poses a grave threat to future generations, yet relatively little research examines children’s understandings of the issue. This study examines the questions children ask about climate change - rather than their answers to adults’ questions – exploring whether their questions suggest they view climate change as psychologically proximal or distant. Children aged 10-12 from fourteen UK schools took part in an online event, asking scientists questions in a ‘climate zone’. The questions were analysed using thematic analysis. The themes related to the nature and reality of climate change, its causes, impacts, and solutions. Participants seemed most exercised about the future impacts of and ways of ameliorating climate change, with some questions evoking science-fiction disaster imagery. The contents of participants’ questions elucidated the ways in which they position climate change as both a proximal and distant phenomenon.

5.1 Introduction

The nature of the potentially devastating impact of climate change on the planet and its occupants is now established (Masson-Delmotte, 2018). Parties to the United Nations Framework Convention on Climate Change (UNFCCC) reached an agreement in 2016 (COP21) to pursue efforts to limit the global mean temperature increase to 1.5°C. To achieve this, action will need to be taken globally, with responsibility assumed by governments, corporations, and individuals. The next generation of adults will inherit this responsibility as they become decision-makers and voters. They will need to be equipped to deal with the challenges brought by the future impacts of climate change. Given this, it is surprising that in the academic literature to date, more attention has been paid to the climate change related perceptions of adults than of children and adolescents. A better understanding of children and adolescents' perceptions of climate change can help inform the way that climate change is communicated to children to best engender their current and future pro-social behaviour and tackle their anxieties in the most helpful way. It could also inform the content and timing of climate change teaching in the curricula.

One concept that has frequently been explored in relation to adults' perceptions of climate change is psychological distance, that is, the propensity to locate the problem of climate change at a distance from the self along spatial, temporal, social and hypothetical lines (Trope & Liberman, 2010). Many scholars have argued that perceiving climate change as more proximal makes it more personally salient (e.g. Reser, Bradley, Ellul) and increases concern and willingness to engage with climate change (Jones, Hine, & Marks, 2017). However, the link between a proximal climate change and engagement is not necessarily straightforward (e.g., Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015).

Little is known about children and adolescents' psychological distancing of climate change. There is some evidence that younger people are more likely to view climate change as psychologically distant than older adults (Corner et al., 2015). A 2019 study found that whilst Swiss adolescents viewed climate change as a real and current threat (hypothetically and temporally proximal), they saw it as a greater threat to other people in other places (socially and spatially distant) (Gubler, Brügger, & Eyer, 2019). Here, a link between psychological closeness and increased concern was established. A recent systematic review concluded that youth in the UK may view climate change as psychologically distant (Lee, Gjersoe, O'Neill, & Barnett, 2020), although no study in the review addressed the concept specifically. In one international study about personal transport in the context of climate change, participants in the UK expressed the lowest level of concern (50%) of the 11 included countries, whereas participants in India (89%) expressed much higher levels of concern (Boyes et al., 2014). Participants in the UK were also far less willing – relative to the extent to which they agree the actions were useful – to

take public transport or drive a smaller car, than those living in India. These differences in levels of concern and willingness to act may arise from participants in the UK viewing climate change as a greater threat to other countries; indeed climate change currently presents a greater risk to India than the UK (Eckstein, Hutfuls, & Winges, 2019). The extent to which children and adolescents view climate change as psychologically distant or proximal, warrants further investigation.

Having established that psychological distance is a useful framing device for exploring children's perceptions of climate change, the question of appropriate methods arises. Much of the research about adolescents' perceptions of climate change takes a 'knowledge-deficit' perspective. That is, assessing the extent to which reported beliefs about climate change correspond to scientific ones (e.g., Punter, Ochando-Pardo, & Garcia, 2011), the difference being attributed to a shortfall in knowledge or information (Suldovsky, 2017). Other studies measure participants' attitudes towards climate change and / or their willingness to take or support particular actions that will contribute to ameliorating its effects (e.g., Chhokar, Dua, Taylor, Boyes, & Stanisstreet, 2012). Participants in these studies respond to a closed-form survey, where responses are usually measured on a five-point scale. Such studies require participants to answer a set of narrow questions which specify both the facets of climate change of interest and the register of permissible responses. Participants can reveal something about how much they know about the factors laid before them, or how willing they might be to take designated actions but nothing about their thoughts and understandings beyond these parameters. Findings from some open-response surveys and qualitative studies have indicated that enabling a broader set of responses leads to more nuanced understanding. For example, concern about climate change seems flexible and context-dependent in qualitative studies in China (Sternäng & Lundholm, 2011, 2012), when responses to closed-form questionnaires indicate very high concern (Boyes, Stanisstreet, & Yongling, 2008). This suggests that participants in closed-form survey studies may be prompted to express what appear to be higher levels of concern when response options are pre-specified and contextual factors omitted.

Many qualitative studies have used open-response surveys, interviews or focus groups (e.g., Scott-Parker & Kumar, 2018). Although these enable a greater breadth of responses, they preserve a hierarchical relationship, with adult researchers directing and child participants responding. In contrast, the present study seeks to privilege the participant by enabling them to ask their own questions about climate change. This approach has been employed relatively infrequently, and mainly in the field of education, by researchers investigating children's interests in science and technology (e.g., Baram-Tsabari & Yarden, 2005), students' interest in chemistry (Demirdogen & Cakmakci, 2014) and young adults' interest in climate change (Tolppanen & Aksela, 2018). The questions in

this latter study related to the ethical, scientific, and societal aspects of climate change (Tolppanen & Aksela, 2018)

With participants asking the questions, control over the direction of enquiry is placed with them (Ripberger, 2011). Question asking is – or has the potential to be – predicated on a desire to know the answer to that particular question, rather than on the requirement to provide an appropriate answer to another’s question (Demirdogen & Cakmakci, 2014). Questions reveal what participants want to know about a particular object (Chin & Osborne, 2008), what they may already think and feel about it (Baram-Tsabari, Sethi, Bry, & Yarden, 2006), and the nature of their expectations of science (Falchetti, Caravita, & Sperduti, 2007). In analysing their questions, we do not seek to compare the accuracy of children’s knowledge with scientific knowledge, or to measure the extent to which they express certain attitudes or beliefs, rather to understand their sense-making around the issue.

This study takes place in the UK, where - contrary to practice elsewhere, where it is taught earlier (George, 2017) – formal teaching about climate change occurs in the second or third year of secondary school (Department for Education, 2014). The study is conducted with participants aged 10-12 in the UK who are pupils in years 6 and 7 at school, the last year of primary education and the first year of secondary. Whilst their teachers may have chosen to incorporate climate change into their lesson plans, these children have not reached the stage of receiving formal teaching on climate change in the Geography and Science curricula.

The research questions are:

1. What questions do 10-12 year old children ask about climate change?
2. Is psychological distancing of climate change evident in these questions?
3. If so, how is this psychological distancing of climate change expressed?

5.2 Method

5.2.1 Design

The study generated qualitative data within a cross-sectional research design. The study received ethical approval from the University of Bath in January 2018.

5.2.2 Procedure

‘I’m a Scientist, get me out of here!’ is an online event organised by a company whose focus is engaging schoolchildren with tertiary science educators. Teachers sign up to take part and each class is allocated a ‘chat’ session that runs during a lesson. During the event, students interact with up to six scientists in science-themed ‘zones’, asking them questions relating to the zone topic and more general

questions. Participating students' identities are not revealed. Zones relate to a broad range of scientific topics (e.g., Stress, Food, Gravity). Some zones are designed for primary school-aged children, some for secondary school-aged children, others for both. Participants are given non-identifying usernames. Each session features at least one and often several scientists. Chats are moderated to ensure that questions remain civil. Participants may ask additional questions via a separate 'Ask' section at any time during the event. Scientists reply to these questions outside the session. The 'Climate zone' ran for two weeks in March 2018. Six scientists took part in the event. Three were PhD students, in earth sciences, social science, and environmental microbiology. The others were a climate and environmental specialist, renewable energy manager, and climate data scientist.

5.2.3 Participants

Seven primary schools (13 year six classes) and seven secondary schools (12 year seven classes) took part in the event. Children were aged between 10 and 12. Ten of the schools were in England, two in Scotland, one in Wales, and one in Northern Ireland. Most of the schools were mixed sex. Ranked by index of multiple deprivation (National Statistics, 2019; Scottish Government, 2016; StatsWales, 2014), the English schools' postcodes were located between the 10-20% most deprived neighbourhoods in the country (two schools), and the 10% least deprived (one school), with the remaining schools spread between these poles. In Scotland, the two schools were in the 30% most deprived and 30% least deprived respectively. The Welsh school was in one of the 30% most deprived postcodes. Data were not available for Northern Ireland.

5.2.4 Analysis

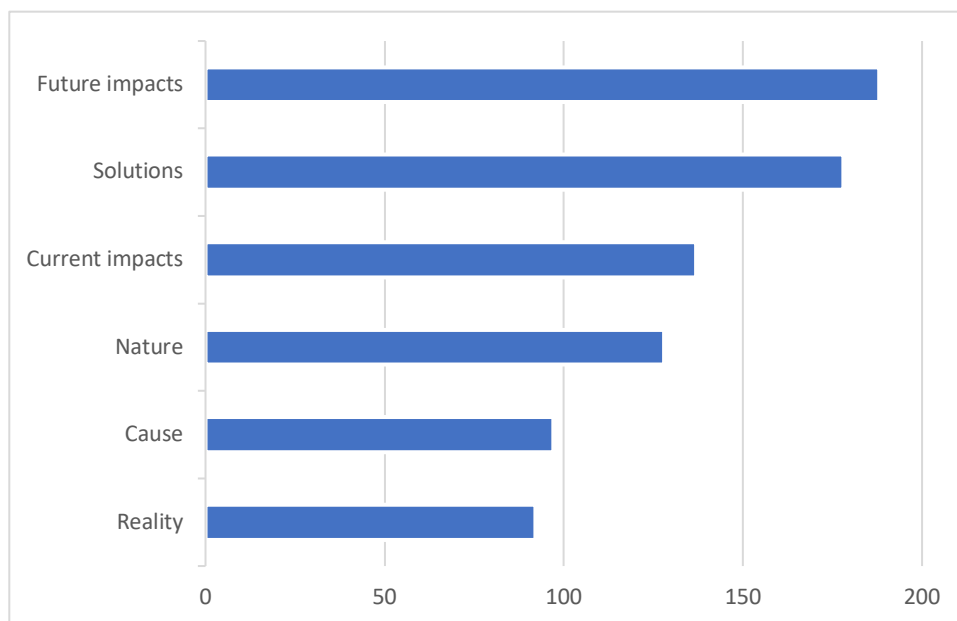
The analysis was informed by a deductive-inductive hybrid framework (Fereday & Muir-Cochrane, 2006). This approach integrates a deductive analysis informed by the four types of psychological distancing (Trope & Liberman, 2010), with an inductive, data-driven analysis. Deductive coding had priority, so the data were first examined for evidence of psychological distancing along any of the four dimensions. Then the data were coded inductively in order to identify any interesting aspects and patterns in the data not accounted for by the deductive coding. The questions relating to climate change were analysed using thematic analysis (Braun & Clarke, 2006) in order to identify meaningful patterns in the data. The authors did not seek to code with a focus on constructing reliable categories as we were working within a qualitative approach that took 'an organic approach to coding and theme development', frequently discussing the material (Clarke & Braun, 2018).

Exactly duplicated questions (48 across all categories, spread evenly across the categories) were removed. The remaining questions were read through several

times, then coded according to subject matter. Observations about the way in which questions were asked (e.g., language use or points of emphasis) were noted. Finally, themes and sub-themes were identified. For consistency, question marks have been added to all questions and first words capitalised. Other grammatical or spelling errors have not been corrected.

5.3 Results

Of the 10,100 lines in the Chat and Ask sections, there were 820 unique questions relating specifically to climate change. Other questions that did not relate to climate change were excluded (e.g., GCSEs needed for a science career, the daily routine of a scientist, food and entertainment preferences). We identified six categories of questions about climate change: *‘The nature of climate change’*, *‘The causes of climate change’*, *‘The current impacts of climate change’*, *‘The future impacts of climate change’*, *‘Resolving climate change’* and *‘The reality/severity of climate change’*. The distribution of questions is shown in Figure 1. A description of each category and sub-themes with exemplar questions are detailed below.



Number of questions

Figure 1. Number of questions in each category

5.3.1 The nature of climate change

The questions in this theme were comprised of requests for information about the essential attributes of climate change. There were two sub-themes:

5.3.1.1 What is climate change?

Questions here tended to be broad and open. In explicitly asking the scientists to explain the concept of climate change, participants acknowledged that establishing the nature of the phenomenon is a legitimate and necessary line of enquiry.

Exemplar questions:

- How could you simply explain climate change?
- Do you know why climate change is very important?
- What is the difference between weather and climate change?

5.3.1.2 What is the timeframe?

These questions related to establishing a timeline, past, present, and future. The way that some questions were phrased seemed to indicate climate change being framed as an 'event', that would occur, or had occurred, rather than an ongoing issue.

Exemplar questions:

- When did the climates start to change?
- When will climate change be at its worst?
- When will climate change end?

5.3.2 The causes of climate change

The questions within this category related to causes of climate change. Two sub-themes were identified:

5.3.2.1 What are the causes?

Some questions were open, others related to existing ideas about causes, such as pollutants or gases. Few questions alluded to actions that they, or ordinary people, might take.

Exemplar questions:

- What impacts climate?
- Why are fossil fuels so damaging even though they are made out of natural resources?
- Does littering affect climate change?

5.3.2.2 Who or what causes climate change?

Questions here related to countries and pollutants. They did not typically refer to individual behaviours.

Exemplar questions:

- Which countries contribute the most to climate change or global warming?
- Which gas affects the climate the most? So the worst greenhouse gas

5.3.3 The current impacts of climate change

Questions in this category were written in the present tense. There were two sub-themes:

5.3.3.1 What are the impacts?

Some questions were broad, but many related to specific and differentiated impacts. This indicates that these participants have a sense that a range of current activities and practices are impacted by climate change. However, impacts were generally geographically removed from the UK.

Exemplar questions:

- What are the worst effects of climate change?
- Are animals such as polar bears who live in cold climates endangered?
- Does climate change have something to do with spreading diseases?

5.3.3.2 Where are the impacts happening?

These questions related to the geographical location of climate change impacts. Almost all questions seemed predicated on the assumption that impacts are affecting places other than the UK.

Exemplar questions:

- What is the main country that has been affected by climate change?
- What country is most affected by climate change?
- Where does climate change affect the world the most?

5.3.4 The future impacts of climate change

Questions in this category were written in the future tense. The imagined future consequence ranged from the mundane to the apocalyptic. Three sub-themes were identified:

5.3.4.1 What are the future impacts?

These questions tended to be specific, relating to future impacts affecting animals, farming, food, and humans. Many questions invoked science-fiction tropes. Participants appeared to align some of the future consequences of climate change with disasters depicted in films or video games.

Exemplar questions:

- Will polar bears melt?
- What happens if the world goes over 4°C?
- What do you think will happen when the sun explodes?
- Can climate change blow up the earth or aliens instead?
- Do you think we will run out of air?

5.3.4.2 Where will the future impacts happen?

Questions here referred to the geographical location of future impacts and few related to the UK. The language around the geographical location of future impacts seemed predicated on greater certainty around the more distant impacts, questions relating to the UK used more speculative language.

Exemplar questions:

- Will climate change affect everybody or just a couple of countries?
- Which countries will have the deadliest temperatures?
- Can global warming affect Britain?

5.3.4.3 When will the future impacts happen?

Questions in the final sub-theme aimed to establish a timeline to future events. Some questions specified timeframes and were fatalistic in tone. Some questions related to participants' own lifetimes and to specific consequences. Some alluded to completely catastrophic consequences.

Exemplar questions:

- How long before global warming kills us all?
- How long will it be until all cities are submerged through climate change?
- When will the earth explode?
- Could humans and living things become extinct in the next century?

5.3.5 Resolving climate change

Questions in this category related to potential solutions to climate change. Three sub-themes were identified:

5.3.5.1 Can it be stopped?

These questions seemed underpinned by uncertainty about whether anything could be done, some questions implied that it might already be too late.

Exemplar questions:

- Is there a way to avoid climate change?
- Can the process be slowed down/stopped in any way?
- Is it too late to do anything about it?

5.3.5.2 *What can be done?*

The personal pronouns employed in the questions in this sub-theme indicated which agents were positioned as responsible or able to provide solutions to climate change. First person pronouns such as 'I', or more frequently 'we', indicated a focus on what could be done individually or collectively. Second person pronouns indicated that responsibility was placed with others, often scientists. The pronoun 'we' was most prevalent, then 'you', then 'I'. Some questions indicated a misapplication of evolutionary concepts, with the notion that humans might rapidly evolve or adapt to avoid the future impacts.

Exemplar questions:

- What is the main thing that as humans we can do to slow down climate change?
- Have you been trying to stop global warming?
- What technology do you think will help solve global warming?
- Should we be vegetarians then?
- Will climate change make us evolve to adapt to constant increase in heat, snow and rain?

5.3.5.3 *Science-fiction solutions?*

In the final sub-theme, participants invoked science-fiction solutions. They enquired about evacuating Earth and colonising other planets or the moon.

Exemplar questions:

- Can we live on Mars to not get the affect of climate change PLEASE ANSWER thank you?
- If we had to evacuate Earth what planet would you say we would have to move to and why?
- When the world ends, could we be able to begin life on the moon?
- What year do you think we will have to evacuate?

5.3.6 **The reality / severity of climate change**

The questions in this category expressed doubt about the veracity or severity of climate change. Three sub-themes were identified:

5.3.6.1 *Is climate change real?*

These questions asked whether climate change exists, with some participants requesting proof. Some of the questions related to the colder-than-usual weather at the time of data collection, implying that this may mean that climate change is not happening.

Exemplar questions:

- Is global warming complete hogwash?

- How can scientists prove global warming is real?
- Is your research accurate?
- Why did we get more snow if the earth is getting warmer?

5.3.6.2 Is climate change caused by human activity?

Questions here related to non-human causes of climate change. These questions seemed predicated on acknowledgement that climate change is real, but uncertainty about its human cause. Again, participants sometimes asked the scientists to provide proof.

Exemplar questions:

- Is the climate change a natural process that the planet goes through every so many thousands or millions of years?
- Are human activities or natural variations in climate responsible for climate change being observed today?
- What proof do we have that climate change is being caused by humans?

5.3.6.3 Is it that bad?

These questions sought positives to set against the acknowledged negatives of climate change.

Exemplar questions:

- Could climate change be good in any way?
- Can climate change somehow be beneficial towards us?
- Although climate change is bad, are there any positive points about it?

5.4 Discussion

5.4.1 What questions were asked?

We analysed the questions that 10 – 12-year olds in the UK asked scientists about climate change. Their questions related to a range of issues, from the nature and reality of the phenomena, to its causes, impacts, and solutions. The questions evidenced a broad awareness of many of the current and future impacts of climate change and their potential seriousness. Questions relating to solutions revealed a focus on what could be done – individually or collectively – with responsibility also placed with scientists and technology. Allusions to science-fiction were made around future impacts and solutions. Some of the questions expressed scepticism about climate change. Whilst the content of some questions could be interpreted to reveal a shortfall in scientifically accurate knowledge, they also reveal the ways in which a focus only on knowledge does not account for the rich and varied ways that children think about climate change. For example, it is notable that

participants did not seem to make what might seem intuitive links between causes and impacts of and solutions to climate change. Most questions relating to solutions to climate change did not refer to the concepts mentioned in questions about causes. This suggests that they may not see them as sides of the same coin but as discrete issues.

5.4.2 Is climate change viewed as psychologically distant?

Their questions indicate that participants see climate change as psychologically distant and proximal. The four dimensions are discussed in turn:

5.4.2.1 Temporal distance

The evidence around temporal distancing was mixed. Questions about the nature and future impacts of climate change seeking to establish the timeline of climate change indicate that some participants may not be sure whether climate change is temporally proximal or distant. Whilst the focus on future impacts is suggestive of temporal distancing, many questions indicated that participants view climate change as a current threat.

5.4.2.2 Spatial distance

Questions relating to current and future climate change impacts referred much more to the distant than local, indicating that climate change is spatially distant. This was underlined by use of speculative language in relation to impacts in the UK, and more certain claims around impacts elsewhere.

5.4.2.3 Social distance

The questions were indicative of climate change being socially proximal and distant. Questioners were often socially distant from climate change impacts, but also asked about its impact on 'us'. The use of personal pronouns suggests that some consider themselves responsible for resolving climate change – albeit more collectively than individually - although scientists and technology were also described as able to provide solutions.

5.4.2.4 Hypothetical distance

Questions relating to scepticism demonstrated that for some participants, climate change is hypothetically distant, although many questions intimated certainty that climate change is a real phenomenon. Some questions contained explicit scepticism about climate change and askers did not couch their questions in a way they might indicate they felt the topic was taboo. We identified three types of scepticism: relating to whether the climate is really changing, whether changes are

human-caused, and whether it is 'all' bad. This mirrors the framework of Rahmstorf (2004).

5.4.2.5 Associations with science-fiction

It could be that associating climate change with science fiction is a means of psychological distancing insofar as aligning it with something so inherently abstract makes it more distant. This could perhaps fit within social or temporal distancing, in that science-fiction is typically removed from the self and set in the future, although participants sometimes placed themselves within the science-fiction scenarios, by referring to 'we' and 'us'. The more dramatic apocalyptic outcomes and science-fiction solutions seem the product of participants' imagination mediating their understanding of risk (Yusoff & Gabrys, 2011), imaginings borrowed from scenes in science-fiction films or video games. Although science and science-fiction analogies are associated (Hughes, Kitzinger, & Murdock, 2008), previous research with young participants has not, to our knowledge, revealed such direct associations with science-fiction. There is likely a methodological explanation for this; quantitative methods commonly used in previous studies do not present children and adolescents with apocalyptic outcomes and science-fiction solutions, but rather with scientifically viable potential impacts and solutions (e.g., Boyes et al., 2014; Daniel, Stanisstree, & Boyes, 2004).

5.4.3 Strengths, limitations and future research

The key strength of this study is the method, which has enabled us to access participants' thoughts and ideas about climate change, some of which would likely not have been expressed in response to researchers' questions. In asking their own questions, participants directed the enquiry, highlighting to us what areas are of interest to them. Their questions are informative, both in relation to providing answers to the questions that researchers would perhaps ask, but importantly in providing some answers to questions we would not think to ask. They also highlighted the contexts in which the concept of psychological distance is expressed.

The environment in which the children participated had arguably greater ecological validity than a survey study, although we do not know the extent to which children may have felt some pressure to perform as they would in class, because of their teacher's presence.

The findings indicate avenues for future research. First, further exploration is warranted of the nuanced ways in which psychological distancing of climate change is manifested in the views of adolescents. Building on this, it is important to establish how this relates to expressions of concern and the kinds of pro-

environmental behaviours – individual and collective – that young people are empowered to carry out, rather than hypothetical future behaviour (Ambusaidi, Boyes, Stanisstreet, & Taylor, 2012). These data were collected in Spring 2018, prior to the publication of the most recent IPCC report (IPCC, 2018) and the ‘school strike for climate’ protests, so it would also be interesting to examine whether and how these events impact youth discourses around climate change and the questions they ask about it. The relationship between psychological distancing and participation in the strikes could also usefully be explored.

5.4.4 Implications

The findings here may have implications for young peoples’ willingness to behave environmentally and their wellbeing. Viewing climate change as a distant problem may reduce both its salience and propensity for engagement. Distancing, as well as the focus on devastating outcomes, may serve to obscure the arguably more likely – but rarely mentioned – impacts on people in the UK, such as water shortages and flooding (Environment Agency, 2018). Viewing science – and science fiction – as the provider of solutions to climate change may be disempowering in that it could diminish the need for action at all levels, as well as creating a false sense of security. Framing climate change as completely disastrous could lead to disillusionment and apathy (Ojala, 2015) rather than hope and engagement (Ojala, 2012). This raises questions about what and when children should be taught about climate change in school. Some of the science-fiction ideas evidenced in the questions indicate that these participants are generating intuitive but inaccurate theories about the science of climate change (Carey, 2009), which may persist if they are not addressed (Kelemen & Rosset, 2009). Some of the questions relating to future impacts were fearful in tone. Fear may be a helpful tool to encourage climate-friendly action (Witte & Allen, 2000), but needs to be coupled with a sense that something can be done (Smith & Leiserowitz, 2014) in order to avoid feelings of hopelessness, a sense of which can increase across childhood (Ojala, 2013). It seems sensible to consider the benefits of introducing climate change into the curriculum at an earlier age, with a focus on dispelling potentially fear-inducing myths, scepticism, and making the issue more salient - and less psychologically distant - by focusing on the local and personally relevant.

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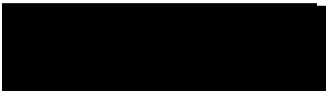
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Linking Text

The aim of Study 2 was to better understand the aspects of climate change that adolescents are concerned with, what they want to know about it, and whether – and how – they situate climate change at a distance from or close to themselves. The findings demonstrated that participants were especially concerned with the future impacts of climate change and solutions to it, with some participants associating climate change impacts and solutions with science-fiction-like concepts. The findings suggested that participants represented climate change as both a proximal and distant phenomenon, depending on the dimension.

Therefore, the aim of Study 3 was to examine the way adolescents position climate change in relation to themselves and their own lives in more depth. The study used the concept of the ‘self-other’ thema – a framework that highlights the way social representations function to protect the self by placing negative valence with the other and positive valence with the self – to explore where and how adolescents situate climate change when talking about its causes, impacts, and solutions. The focus in this study was therefore the function and purpose of social representations; the extent to which representations are active and used to position and maintain a positive sense of self. Focus groups – a context in which relatively naturalistic negotiation and debate can take place – were used in order to understand whether and how these self-other positions are negotiated by groups of adolescents. Five focus groups were conducted with adolescents aged 11 to 14.

Statement of Authorship

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Copyright status (tick the appropriate statement)										
I hold the copyright for this material				<input checked="" type="checkbox"/>	Copyright is retained by the publisher, but I have been given permission to replicate the material here					<input type="checkbox"/>
Candidate's contribution to the paper (provide details, and also indicate as a percentage)	<p>The candidate predominantly executed the...</p> <p>Formulation of ideas: KL Predominantly executed (90%) with help from JB.</p> <p>Design of methodology: KL predominantly executed (90%) with supervisory support from JB.</p> <p>Experimental work Predominantly conducted by KL (90%) who conducted the focused groups and analysed data, with some input from JB.</p> <p>Presentation of data in journal format: KL predominantly executed (85%), with input from JB.</p>									
Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.									
Signed						Date	01/12/20			

6 Adolescents' representations of climate change: exploring the self-other thema in a focus group study

Abstract

Research on social representations of risks has indicated that the self-other thema underpins representations of a number of threats. This focus group study, conducted with adolescents aged 11 to 14 in the UK, explored the ways in which the self and other were positioned in relation to climate change causes, impacts, and solutions. We found that the self and other were constructed and deployed differently, depending on the focus of discussion, serving to present the self more positively than the other. Responsibility for causing climate change was placed with other countries rather than the UK. The impacts of climate change were depicted as more severe for other people in other countries and to threaten the far future more than the present. Others – the UK government and older generations – were deemed straightforwardly responsible for resolving climate change, whilst explanations and justifications for participants' own actions were more complex.

6.1 Introduction

Scientists agree that climate change is anthropogenic (Neukom, Steiger, Gómez-Navarro, Wang, & Werner, 2019), and presents a critical threat (IPCC, 2018). Limiting the global mean temperature increase to 1.5°C, an aim agreed by parties to the United Nations Framework Convention on Climate Change (UNFCCC), will require everyone to act to mitigate against and adapt to climate change. Recognising this need, young voices are now speaking out. ‘Skolstrejk för klimatet’ (‘School strike for climate’) - a movement started in 2018 by Greta Thunberg - has gathered pace, with around six million taking part globally in September 2019 (Taylor, Watts, & Bartlett, 2019). The movement acknowledges that young people will be more affected by future climate impacts (Warren, 2019), and calls for governments to listen to the scientific evidence and start behaving as though climate change is a crisis. A number of scientists (e.g., Hagedorn et al., 2019) have expressed their support. However, despite younger and future generations being more at risk from the future impacts of climate change, there has to date been more focus on adults’ climate change perceptions (e.g., Lorenzoni, Leiserowitz, De Franca Doria, Poortinga, & Pidgeon, 2006; Weber, 2010) than children and adolescents’.

Much of the research conducted with children and adolescents seeks to understand the extent to which their knowledge of climate change causes, impacts, and solutions is scientifically accurate (e.g., Hermans & Korhonen, 2017). Most of this research employs quantitative methods, particularly closed-form questionnaires (Lee, Gjersoe, O’Neill, & Barnett, 2020). Children and adolescents’ scientifically correct knowledge about the causes and impacts of, and solutions to climate change generally improves with age, although misconceptions persist across the age range (e.g., Stevenson, Peterson, & Bradshaw, 2016). Some studies focus on belief and concern about climate change, and whether participants are willing to take particular actions to mitigate climate change (e.g., Boyes et al., 2014). Belief, concern, and willingness to act varies according to geographical location. Participants in Singapore, India, or Turkey report higher levels of concern and more willingness to take actions than those living in the UK or USA (Boyes et al., 2014). This could be a reflection of participants’ relative proximity to the tangible effects of climate change influencing the extent to which they view it as a personal threat (Gubler, Brügger, & Eyer, 2019). Psychological distancing of climate change – a propensity to locate the problem with other peoples and distant places – is an established phenomenon in the adult climate change literature (e.g., Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015).

6.1.1 Social representations and climate change

One approach that facilitates a broad understanding of how people perceive scientific objects is Social Representation Theory (SRT) (Moscovici, 1961). SRT

examines the way in which scientific knowledge becomes lay knowledge; how the abstract, complex, and reified world of science becomes concrete, simple, and every day (Moscovici, 1961). SRT has underpinned a range of studies examining participants' understandings of phenomena including blood donation (Moloney, Gamble, Hayman, & Smith, 2015), hospital superbugs (Washer & Joffe, 2006), emerging infectious diseases (Idoiaga Mondragon, Gil de Montes, & Valencia, 2017), genetically modified food (Ribeiro, Barone, & Behrens, 2016), and climate change (Wibeck, 2014). Researchers using SRT focus on the nature of peoples' thinking for its own sake, rather than whether thinking is scientifically correct.

Objects in the natural sciences – like climate change – are monological, but social representations of climate change – objects in the social sciences – are dialogical (Liu, 2004), they are co-created and shared in context. A representation is not a reproduction of an object, but a re-presentation of it (Markova 2000). Climate change studies underpinned by a knowledge-deficit approach seem concerned with participants' knowledge about the monological, whereas studies underpinned by SRT are concerned with the dialogical meanings people make of climate change. Social representations are multiple and not necessarily consensual (Rose et al., 1995). In the case of climate change, that climate change is wholly anthropogenic, natural, or both (Olausson, 2011). Nor are representations static as people can, and do, deploy different, contradictory representations (Rogers, Stenner, & Gleeson, 1995); a social representation does and is. This accounts for why groups in different parts of the world represent the same object in different ways, as their representations are influenced by and reflective of cultural needs. For example, representations of AIDS in Zambia (Joffe & Bettega, 2003) and the USA (Joffe, 2002) serve to place responsibility and vulnerability elsewhere. Similarly, the way in which some cultures embrace certain technologies, such as nuclear power or GM foods, whilst others reject it (Jasanoff, 2010), is reflective of culturally-specific influences on social representations of these technologies.

According to Marková (2003), themata are the latent structures that structure dialogical social representations. Themata were described as the dyadic oppositions – such as stability/change – that underpin all scientific thinking (Holton, 1975). These were introduced into SRT as elements underpinning common-sense thinking (Moscovici, 1993). Themata are comprised of antithetical poles that enable people to orient themselves with, deploy, and understand a range of positions on a particular issue (Smith, O'Connor, & Joffe, 2015). Social representations of organ donation are underpinned by themata such as life/death (Moloney et al., 2015). Representations of climate change by themata such as natural/unnatural (Smith & Joffe, 2013). A key function of a representation is to defend against threat to the self or the in-group (Moscovici, 1976); they are shaped by a kind of social evolution that enables communication and co-operation to protect survival (Lahlou, 2001). Themata afford protection to an individual and their group when positive valence is attributed to the pole more associated with the self, and negative valence to the pole more associated with the other (Markova

2015). Smith et al. (2015) suggest that all themata are underpinned by a core thema of self/other that works to protect an individual and their group's identity, an 'epistemological thema' (Marková, 2017).

6.1.2 The present study

This study took place in the UK, where the government has taken a relatively progressive stance on climate change compared to other countries, introducing legislation around reducing greenhouse gases over a decade ago (Climate Change Act, 2008). More recently - in response to the school climate strikes and the Extinction Rebellion movement - it declared a climate emergency in 2019 (Commons Select Committee, 2019). However, the ongoing debates around issues that are at odds with the objectives outlined in legislation - such as airport expansion (HM Government, 2019) - demonstrate less wholehearted commitment. In the UK, climate change is not formally on the curricula until pupils are in their second or third year of secondary school (Department for Education, 2014). This also seems at odds with climate change being an emergency, an argument made by the official opposition party (The Labour Party, 2019).

The study seeks to identify how the self/other thema underpins adolescents' representations of climate change. The study employs a focus group design. Focus groups are appropriate for studying social representations because they provide an environment for the co-creation, expression, and negotiation of representations (Wibeck, 2014). They are a relatively more naturalistic means of collecting data (Wellings, Branigan, & Mitchell, 2000), useful for understanding the way participants understand an issue as - even if follow a topic guide - they do not prescribe responses (Braun & Clarke, 2013). Their interactive nature enables the production of shared and differentiated understandings (Kitzinger, 1994). The aim of the study is to examine the ways in which the self/other thema is constructed and deployed in discussions about climate change.

6.2 Method

6.2.1 Design

The study employed a qualitative cross-sectional focus group design, receiving ethical approval from the University of Bath in February 2019.

6.2.2 Procedure

The study was advertised through local on and offline message boards. After obtaining parental consent, focus groups were organised so that the participants in each group were of a similar age and/or knew one another. The aim was to recruit groups of four or five participants (Morgan, Gibbs, Maxwell, & Britten, 2002).

Groups were conducted in March and April 2019. At the start of each group, participants read an information sheet and were given the opportunity to ask questions, before providing assent. A semi-structured topic guide was followed, including topics such as the nature of climate change, its cause, impacts and solutions. At the end of each group, participants read a debriefing sheet. They were given a £10 voucher to thank them for taking part.

6.2.3 Participants

A total of 22 participants were allocated into five focus groups. All the participants lived in a city in the south west of England. They were aged between 11 and 14, and in years 7, 8, or 9 at school. A summary of groups is shown in table 1.

Table 1. Summary of participants – Pseudonym, Year group (Age)

FG1	FG2	FG3	FG4	FG5
Tom, Y9 (14)	Lia, Y8 (13)	Amy, Y7 (12)	Nas, Y9 (14)	Oliver, Y9 (14)
David, Y9 (14)	Ruby, Y8 (12)	Jane, Y7 (12)	Becki, Y9 (14)	Linus, Y9 (14)
Finley, Y8 (12)	Bea, Y7 (12)	Katy, Y7 (12)	Shola, Y7 (12)	Alex, Y9 (14)
Sophie, Y7 (12)	Imogen, Y7 (12)	Maria, Y7 (11)	Annie, Y7 (11)	James, Y9 (14)
Ellie, Y7 (11)	Molly, Y7 (11)			

6.2.4 Analysis

The focus groups were audio recorded and transcribed verbatim. An integrated deductive-inductive approach was employed (Fereday & Muir-Cochrane, 2006). The concept of the self-other thema provided a deductive framework; an inductive, bottom-up approach was taken towards the data itself. First the data were coded deductively, looking for instances of participants relating climate change to the self or other. Then the data were coded inductively, looking for interesting aspects or patterns in the data were not accounted for in the deductive coding. The data were analysed using thematic analysis in order to identify patterns of meaning, similarities and differences across the dataset (Braun & Clarke, 2006). Data were coded, codes were grouped, then brought together into themes. Attention was paid to the way that participants aligned their views with others and negotiated differences of opinion.

6.3 Results

The self-other thema structured participants' representations of climate change. However, self and the other were constructed and deployed differently, depending on whether discussions were focused on causes, consequences, or solutions. The results are organised into three sections that explore the nature and positioning of the self and the other in relation to these three phenomena. The first section, 'The

variable other causes climate change', relates to the way that participants depicted multiple others as responsible for causing climate change –blame was not allocated equally to these others - with little responsibility attributed to the self. The second, 'Protecting the self from the Impacts of climate change', outlines the way many participants attempted to place the more severe impacts of climate change with the other rather than the self. The last, 'The complex self, the simple other: solutions to climate change', relates to the contrast between sometimes contradictory positions taken in relation to actions of the self, and more straightforward discussions about the actions of others.

6.3.1 The variable other causes climate change

When discussing causes of climate change, participants began by talking about what is responsible, referring to pollutants and their source: factories, flying, and meat production. After discussing *what* is responsible, they quickly turned to *who* is responsible. The self was not prominent in these discussions, present only as an upstanding foil to more blame-worthy others. There were several others, but China was polluter-in-chief. To a lesser degree, America and nameless 'poor countries' were held responsible for causing climate change, but the judgements made of them were less definitive. The participants articulated three ways in which others were responsible. First, because they prioritised economic growth over climate protection. In this extract, Group 1 discuss how economic development in China and wealth preservation in the USA are responsible for causing climate change:

I: What do you think is the biggest cause of climate change?

Finley: Um, low income countries just like soaring up and developing quickly and not like learning properly how to take care of the environment. Like China for example hasn't learnt completely how to um, like not just use fossil fuels and (pause)

I: Do you think that, cos that's kind of quite a complicated moral thing isn't it, because I suppose we've burnt loads of fossil fuels haven't we? So, in a way, is it okay for us to tell China that they need to do it differently?

Finley: Um, we should like let them know how to do it, um, because when we were developing, um we did the same thing, it took us some time to switch to renewables, um. But we just should let them know.

David: Well there's an agreement between all the major countries to reduce their um, CO₂ emissions but America, they've somehow, I think they said oh, yeah it's the, the agreement is out of date so now' they can produce as much as they like.

I: Yeah

David: But that's since Donald Trump's been elected because he just wants to make more money so, they've um kind of pulled out of that agreement so that was one way of everybody reducing it but people are going up against it.

Finley: Yeah and Donald Trump's like friends with some big oil companies so he's trying to keep them alive so that they pay him, and he gets more money.

The language Finley uses positions China as irresponsible because it prioritises growth and has not 'learnt' (a word he uses twice) to care for the environment. A lack of learning may suggest ignorance, although if this is what Finley means, he does not indicate whether this is wilful. 'Soaring' connotes rapidity and scale and seems used here to imply that the scope of China's development is neither appropriate nor responsible. Later, he responds to the question of whether it is morally acceptable to pass judgement on China by positioning 'us' as teacher and China as student. In so doing, and with his claim that we have now switched to renewables, he elevates 'us' to a more virtuous and learned position than 'them'. David shifts the conversation to America pulling out of the Paris Climate Agreement. He attributes this to the desire to make more money and names Donald Trump specifically, suggesting the withdrawal was financially motivated. Finley supports this by suggesting that Trump is 'friends' with oil companies for financial gain. There is an interesting contrast in the way that the two antagonists are positioned. When the other is America, it is personified by Donald Trump. He, rather than America per se, is the problem. In contrast, there is the homogenous 'China'.

Second, large populations were said to cause climate change, as evidenced in this extract from Group 2:

I: And do you think, in terms of parts of the world, do you think there are some countries that are causing more of the problem than others, and if so, which ones

Ruby: I think the countries with more cities are causing more of the climate change because they are doing more, there is more population and I sometimes think China is causing more pollution because it has the biggest population on earth

I: Yeah

Imogen: It's where a lot of the factories are, to make things

This argument is based in the logic that larger populations equate to more pollution. It does not consider whether consumers in other countries may be driving demand for production in the Chinese factories. The argument that blame can be indirect was made in relation to other countries, but not China. For example, one group discussed the concept in relation to Brazil, who are sometimes said to be causing climate change because they produce large quantities of meat. However, because most of this meat is exported to richer countries, it is they rather than Brazil who bear the 'true' responsibility. Here they defined two, not equally responsible, others.

Last, the other's incorrect or careless practices were claimed to cause climate change. This extract is from group 4:

Becki: I feel like, if you don't recycle then it's bad but then also like for example, our country is quite good at recycling but places like China, they don't really care and they like throw everything in like rivers and then it like pollutes and then it like spreads to Earth and it like affects us as well as them.

Annie: Yeah, but, yeah, and industrial, cos they're way bigger, like factories, all the fuels that they are using can create loads of air pollution and stuff.

Some lines later:

I: And do you think, when you think of parts of the world, you've mentioned China, but do you think that are certain areas of the world that are more kind of responsible for causing climate change than others?

Multiple: Yeah

Shola: Big cities

Becki: I feel like, yeah, like less developed countries don't really have the like, the like, like I don't know, like..

Annie: The equipment?

Becki: Yeah, they don't have the resources to like properly recycle, and realise, I think

In this extract, both China and 'less developed countries' are the other. Becki begins by stating that China's environmental practices are poor because it doesn't care. She makes an explicit link between China's irresponsible actions and a negative impact on a more virtuous self, because unlike China, 'our country is quite good at recycling'. It is interesting that she uses the personal pronoun 'they' to refer to China, she applies this judgement to China as a unit. Annie reinforces Becki, referring to them producing on a grand scale. In this discussion, China is not positioned as a 'developing country'. They seem to occupy a special place between a more moral and learned 'us', and unnamed 'developing countries' who are worthy of being attributed extenuating circumstances. There is more leeway extended to these countries, as evidenced in Becki and Annie's final comments, which imply that their ignorance ('they do not realise') may be explained by a lack of knowledge, equipment, or resources, rather than, in the case of China, something more akin to recklessness. Although largely absent from these discussions, where present the self is positioned simply, as more correct than the other. The other is differentiated in that whilst there is a blanket depersonalised allocation of blame to an immoral or unethical China, attributions of blame to the different others are complex and render them less 'blameworthy'. In the case of the USA, a greedy Donald Trump is responsible. In the case of poor or developing countries, they bear less responsibility because they are exploited by others or have inadequate resources.

6.3.2 Protecting the self from the impacts of climate change

When talking about the impacts of climate change, many participants situated impacts at a distance, although there was debate. Impacts on the self and other were located in relation to psychological distance (Trope & Liberman, 2010):

temporal, spatial, or social. All of the groups referred to '12 years', gleaned from detail contained in the widely publicised 2018 IPCC (2018) report. They did not always seem sure about the precise implications of '12 years' but seemed to recognise that it represented a clarion call to action, probably because by its very nature, '12 years' is a point in time occurring well within their lifetimes. Nonetheless, there was some debate about how far in the future climate change impacts would be felt, where impacts would be located, and who would be affected. In this extract from Group 3, participants are negotiating the spatial and temporal locations of future impacts of climate change:

I: Um, and what, what do you think are some of the things that are going to happen in the future then? Like here and in the rest of the world?

Jane: It's gonna get warmer

Katy: But like it's gonna get warmer here but the actual effects are like will be we might not be able to grow like food and stuff

Maria: Yeah, we might not be able to survive and then everything will die and then the world will explode. Well, it won't explode, but...

Amy: I think it will affect poorer countries more because they might not have much money to support themselves

I: (To Amy) Say that again, what did you just say?

Amy: Oh, that poorer countries, they don't have as much money to support themselves

Jane: Like India

I: Yeah

Maria: In the very, very, very far future things will probably um, everything will probably die

Amy: That's not the VERY far future

Maria: Yeah, it's probably, like...

Amy: In our lifetime things will go downhill

I: Do you think so?

Amy: Uh-huh

Jane: But Sydney isn't going to be able to live where they are living 'cos it's gonna get too warm

During this exchange, the temporal and spatial location of the future impacts of climate change are in flux. The future impacts of climate change are positioned and repositioned in relation to the self and the other. Impacts are located spatially close, then distant, temporally distant then close, finally spatially distant again. Katy responds to the initial question about potential future impacts by stating that it is going to get warmer 'here' and consequently, 'we' won't be able to grow food. Maria adds that 'we' might not be able to survive. Up to this point, use of these words position the effects of climate change as impacting - or potentially impacting - the self. Maria goes in a different direction, stating that in the future everything will die, and the world will explode. In evoking something so extreme, she situates the impacts at a distance. Amy maintains spatial distance by adding

that it will be poorer countries who will be more affected, Jane supports this by giving a concrete example of such a 'poor' (and distant) country. Maria revisits her earlier point about everything dying, describing this as taking place in the 'very, very, very far future', her repetition of 'very' ensuring that these impacts are placed into the distant future and well away from the self. Amy contradicts Maria by positioning the impacts as something that will happen 'in our lifetime', bringing it closer to them again. Finally, Jane makes a tangential point about future impacts in Sydney – about as spatially distant from 'us' as it is possible to be – placing devastating future impacts at a distance and with the other once again. Here, Jane and Maria seem determined to resist the attempts by Katy and Amy to locate any impacts of climate change with the self, deflecting them each time to the other.

Participants sometimes spoke about how the UK is or will be impacted by climate change. These impacts were typically spoken about in quite positive terms, such as eating lunch outside or wearing shorts in February. In this extract from group 3, the impacts in the UK are discussed:

Katy: Well I don't really know, what, er so far I don't think it's affected our lives but it's obviously, you hear about it on the news and it's obviously affected like...

Jane: Other people

Katy: Other..

Maria: Yeah, but in the near future..

Amy: We're just having warmer summers and stuff

Maria: Yeah

Jane: That's quite nice!

Katy: And colder winters

Amy: Nice but bad

Maria: Yeah

Jane: Get the water slide out!

Katy: But I don't really know, like what the actual effects will come to for our country

There is a contrast between the way the participants talk about how climate change impacts the self and the other. In the above extract, Jane and Katy explicitly state that climate change has impacted 'other' people, which contrasts with minimised - even welcomed - impacts on the self. Katy admits she isn't sure about impacts in the UK. Amy is more measured, acknowledging that these positively perceived impacts are in fact, 'bad'. However, although she suggests something ominous for the self, she is not specific.

6.3.3 The complex self, the simple other: solutions to climate change

This section relates to the interplay between the self and other in relation to climate change solutions and is broken into three sub-sections. The first, 'The powerful other, the powerless self', relates to a more powerful other – the government – and a powerless self. The second, 'The inattentive other, the attentive self', relates to a second other – the older generation – that does too little, despite being more able to act on climate change than the self. The last, 'The self without the other' relates to more complex justifications of participants' own behaviours, in the absence of the other.

6.3.3.1 *The powerful other, the powerless self*

The participants identified specific solutions to climate change, such as switching to green energy and reducing factory pollution. These potential solutions were situated within systems of unequal power. Participants positioned powerful governments as most able to carry out or enforce much of the needed action, by creating infrastructure or regulating companies. Occasionally, they asserted the importance of their own actions by outlining the practices they can take, such as recycling. However, these were often set in the context of larger-scale actions being more meaningful, which seemed to reinforce their powerless status. This extract is from Group 2:

I: Okay, so what do you think um, can be done about climate change?

Ruby: I think the government needs to do something about it because the government is in charge of everything and the people can't really do stuff without the government's permission. And if the government is like the head of the country and if we don't take action then some bad things will start happening

Molly: I think everyone needs to do some little things as well because like some people think that 'oh well, it's just, I can't really do this because I'm just one person' but if every single person does little things then it adds up to quite a big help

Imogen: The government could make more laws about like cars and...

Bea: They could produce electricity in different ways like using solar power because you won't have to burn fossil fuels

In this extract, Ruby positions the government as all-powerful, claiming that nothing is possible without governmental involvement. In arguing that people cannot act without the government's permission, she places all responsibility for acting on climate change with the government and none with the self. In response to this, Molly asserts that little things add up, individuals have and can take responsibility. However, Imogen immediately returns responsibility to the

government and Bea outlines the greener energy production possibilities ‘they’ could pursue. Although Imogen and Bea do not explicitly disagree with Molly here, in returning the focus to governmental actions rather than engaging with her directly, they seem to indicate they disagree that the actions of the self are important.

Some participants expressed dissatisfaction with the UK government for prioritising other less important issues, even suggesting that this may be deliberate. This extract is from group 1:

Sophie: I feel like the government should stop fussing about things that don't, that not, like doesn't really matter as much as our earth

I: Yeah? And what sort of things are they fussing about?

Sophie: Brexit, yeah. And um, all this, it's basically just bickering about this small, you might call it a small thing, I'd say it was a small thing, this small thing that doesn't matter, like it's not, it's, we've got other priorities at the moment and Brexit is not one of them, for me, that's what I think

Finley: I've just thought about this now but I think that one of the reasons that they keep rescheduling Brexit might be so um, for climate change they don't really want to get into the subject so they might be wanting to go and just stick with Brexit and so, like people just get bored, and then...

I: Do you think so? So actively trying to...

Finley: Avoid it

Finley suggesting that the government may be deliberately focusing on other matters in order to avoid tackling climate change reinforces the other's power to set the agenda it chooses, in contrast to limited opportunities for the powerless self.

6.3.3.2 *The inattentive other, the attentive self*

Other actors - to blame for causing climate change - were deemed to be shirking responsibility for resolving it. Participants described climate change as a problem inflicted upon them by older generations. As such, they argued that they should take responsibility for resolving it but wouldn't because they would be old, dead, or 'in a home' by the time climate change impacts mattered. Some participants mentioned an older person who did care, such as a 93-year-old man who was repeatedly arrested whilst protesting with Extinction Rebellion, but this was set in the context of caring for his children and grandchildren's futures, reinforcing the idea that it will not affect the older generation directly. This created a tension between an inattentive, but more powerful other and a more vulnerable self that lacked power. This extract is from group 4:

Becki: Yeah, like they think 'oh, it's not in our generation', like 'it won't affect us'

Nas: Nothing bad's gonna happen

Becki: But like, it will. It's like, within the next 12 years like bad things will start to happen if we don't take action now and then it will like, erm, the next generation will suffer

I: Yep

Annie: Yeah, like our generation, like the adults, like our parents, like when things start to get bad, they'll be like, I dunno, sixty or something and then we'll be around, like, I don't know, 20, and they won't really do anything to stop it because they think it's not in their generation.

This sense of unfair power distribution was apparent in participants' desire to vote on environmental and other issues affecting their future. Several participants observed parallels with the EU referendum and climate change, with outcomes of both having a far greater impact on them than those voting, examples of being 'overpowered' by adults. This extract about voting is from group 3:

Maria: No, but let um, let children um, over the age of 12 allowed to vote for environmental things!

Jane (to Maria, because she is 11) You're not allowed to then! You're not allowed to!

Maria: Yeah, I know. But...

I: Okay, but why 12?

Maria: Well if you're like younger than 12 you're probably haven't been like educated enough

*Amy: I don't think you should be 12, I think you should be...
(inaudible)*

Maria: Yeah, but if you're in year 7 and above and like...

I: Secondary school?

Maria: Yeah

Amy: I think you should be 15 to be able to vote for the environment cos then you're a bit more mature

I: Okay, and what about, about older people who ARE voting then, do you think they should still be allowed to vote?

Katy: But that's why... When we were walking down here, we were talking a bit about it, cos like a bit like when there was the vote to leave the EU I wanted like, children to be able to vote, because...

Amy: We're the ones who it will affect us

Katy: If, I don't know, if the amount of people meaning that the 90-year old plus people are like tipping over to another thing then they're not be the ones growing up in that world and...

Amy: I think if you are over 80

Maria: (Interrupting) I know some people...

Amy: You shouldn't be eligible

Maria: I know some people who have let their grandchildren decide like, what to vote.

There is some debate about the right voting age, and it is interesting that they do not reach a consensus. However, they do agree that at some point in early to mid-adolescence, teenagers should be able to vote on issues that affect their future. Some participants went further and suggested, as Amy does, that passed a certain age, 'old' people should not be able to vote.

6.3.3.3 *The self without the other*

Where the other is concerned, responsibility for resolving climate change was presented as clear-cut. Where discussion turned to personal responsibility, some participants spoke of the helpful actions they took, such as recycling, or walking to school. There was a sense in this kind of talk that they were presenting the ways in which they were 'doing their bit'. Of perhaps more interest, were the resources participants used to defend some behaviours they had identified as causing climate change. Although they may not have complete autonomy (they may be over-ruled by their parents if they wanted to become vegetarian, for example), their defence of some personal actions was vociferous. In this extract from group 1, participants respond to a question about vegetarianism. They had earlier categorically identified meat farming as a major contributor to climate change:

I: Do you think being vegetarian is something we should all be doing?

Several: No!

Sophie: No, no, because we need that meat inside us. We need it to make, it helps us be like human and stuff but if we all just do it, I don't know...

David: Well my argument is that it's the main source of protein and me, I'm type 1 diabetic and without meat, um, it would be much harder to, er, manage. Because, er, it's a lot to get your head around diabetes but there are an increased amount and protein is what can help, protein basically just helps them with their life. Like I couldn't become a vegetarian because I'd probably just get ill because, just eating vegetables and carbohydrates, but, it's like vegans as well, cos that's when I think for me it's just, it's just too extreme cos you're getting rid of things that your body really genuinely needs to sustain itself. I don't think being vegetarian, yeah, it would help but then I don't think it would help people, it might just make their diets worse if they don't have, um, something to fill them up they'll probably end up just eating more. So...

I: (To others) What do you guys think?

Finley: Um, yeah, I think the same. I think vegans are like a bit extreme, vegetarians are okay if you are like conservative and still eat some proteins, um, cos like if we have everyone was vegan or vegetarian then there wouldn't be much plants left.

The claim that meat-eating is essential for human health was articulated by other groups, with others also stating that veganism was 'extreme'. Participants positioned meat protein as vital to human health. In the above extract, Sophie

reifies meat as something we need, and if taken at face value, suggests that not eating meat might make us less human. David acknowledges that not eating meat might help the planet but that it would be unhelpful for human health because giving up meat would result in a deficient diet. Finley reinforces David, saying that veganism is too extreme. Their discourse around meat-eating appears contradictory when considering their position on meat production being a cause of climate change. However, these two arguments co-exist but do not co-occur, each is made of its own logic: meat-eating is bad for the planet because it causes climate change and good for humans because it provides them with nutrients that maintain health. Similar arguments were made about flying, which participants had identified as a cause of climate change. Where attention turned to their own flying, they positioned other issues, such as driving or factory pollution, as more problematic than aviation. When it came to the potentially controversial actions taken by the self, participants made justifications based on minimisation or necessity. They do not – as could be expected – recruit the other in their arguments (e.g., my parents won't let me be vegetarian), but defended actions on their own terms. In so doing, they give themselves an autonomy and a range of possible positions they did not afford themselves in the other sub-themes.

6.4 Discussion

This study analysed the talk produced in five focus groups with 22 adolescents aged 11 to 14. It identified three ways in which the self-other thema structured participants' representations of climate change. First, they positioned the other as uncomplicatedly responsible for causing climate change. Second, they tended to locate the more severe impacts of climate change with the other more than the self. Finally, others' responsibility for resolving climate change was presented as straightforward, compared to equivocal positions on individual actions. What constituted the self and the other differed according to whether the talk was focused on causes, consequences, or solutions, but in each case the talk functioned to position the self positively (Smith et al., 2015). The self was the collective UK in the case of causes, where our more wholesome practices were contrasted with those of less learned or responsible others. The self was also the collective UK in relation to the impacts of climate change. The impacts were more often attributed to other people and other places and whilst some participants acknowledged impacts in the UK, they tended to be depicted as less serious. When talk related to solutions to climate change, the self was the participants and their peers. The self was positioned positively when participants talked about their own climate-friendly actions. This positive valence was maintained when they argued that certain actions they took were essential, or less harmful than other actions. The self was positioned positively when they attributed responsibility to others, who were not bearing their responsibilities appropriately. There were no notable age-related differences; climate change was discussed and related to the self and other in the same way in all five focus groups. The three positionings of the self and other and potential implications are discussed below.

6.4.1 The variable ‘other’ causes climate change

The self (the UK as a country) was almost entirely absent from discussions of responsibility for causing climate change, the other was front and centre. Three reasons were given for the other being responsible: prioritising economic growth over climate concern, large populations, and irresponsible practices. The negatively-valenced and culpable other was contrasted with the positively-valenced self, we have already ‘learnt’ to behave in environmentally friendly ways, have switched to renewables, are good at recycling. The way that participants talked about China was different to the discussion of other responsible countries, China was deemed most blameworthy (similarly, China, USA, and India were considered blameworthy in a social representations study with adult participants (Smith & Joffe, 2013)). Where the USA was held accountable, Donald Trump was the key symbol, like George W. Bush in the previous decade (Smith & Joffe, 2013). America’s blame was his. Other countries were held responsible, but they were usually nameless ‘poor’ countries. Here, mitigating factors were provided: they did not have resources, they were not aware, they were being exploited. China as the other was distinct in that no such mitigating factors or responsible persons were proffered.

Positioning China as so overwhelmingly responsible could be unhelpful, if it means the actions of the UK are considered beyond reproach and we bear little responsibility for resolving it. It risks stigmatising China, who became the world’s biggest CO₂ emitter in 2015 (Zhang et al., 2017), but produce less CO₂ per capita than many oil-producing countries, or countries with high overall emissions, such as Australia (Ritchie & Roser, 2020). It obscures the picture in relation to cumulative emissions, where the USA and the EU-28 have still contributed the most (Ritchie & Roser, 2020). Attributing responsibility to ‘poor’ and ‘developing’ countries may also be unhelpful without considering that there is little equity in the relationship between emissions and vulnerability to climate change impacts (Althor, Watson, & Fuller, 2016).

6.4.2 Protecting the self from the impacts of climate change

When discussing impacts, the self was the UK as a nation. The way that they placed the self and other in relation to the impacts of climate change suggests that these UK adolescents, like adults, place some impacts of climate change at a psychological distance (Spence, Poortinga, & Pidgeon, 2012). These participants did not claim that climate change is not real, anthropogenic, or problematic; climate change was not distant along the hypothetical dimension (Trope & Liberman, 2010). However, climate change was socially distant when impacts were placed with other people more than the self. When impacts on the self were discussed they were sometimes minimised, with jokey references to water slides

and warmer summers. It was spatially distant because impacts were described to affect distant places more than the UK. It was temporally distant when participants described impacts occurring far in the future. Some participants worked hard to counter suggestions that impacts might be felt in their lifetimes, by emphasising temporal distance (*'very, very, very far future'*), although other participants did resist this, offering counter arguments. This was possibly because of the '12 years' slogan, which was generally quoted to draw attention to the problem of others not acting on climate change. Some participants resisted the notion that climate change impacts would not affect them and the UK specifically, but where there was acknowledgement that impacts could be proximal, they were presented with less certainty and specificity than were more distant impacts. In placing current and future climate change impacts with the other, participants associated a positive valence with the self and a negative valence with the other. In the same way that placing responsibility with others may reduce willingness to take action, so too might viewing impacts as psychologically distant (Uzzell, 2000), although the link between psychological distance and action is not necessarily straightforward (Brügger et al., 2015).

6.4.3 The complex self, the simple other: solutions to climate change

When discussing solutions to climate change, the self and other were situated in the UK. The other was the government, who was afforded the largest share of responsibility for resolving climate change. Some criticised the government for doing too little, or for being distracted by other less important issues, such as Brexit. Here, the other's inaction had a negative impact on the self. The other was also older generations, who were unmotivated to act because as climate change would not impact their own lives, they did not care about it. Here, as with the government, the positioning of the other is simple, there are actions they should be taking, and their inaction has a negative impact on the self. A positively-valenced self was achieved through claims of pro-environmental behaviours such as recycling. In justifying behaviours that they had previously identified as environmentally harmful, they brought to bear quite logical – albeit contradictory – arguments to defend them. They could have claimed that their powerless state was behind certain actions such as eating meat or flying by blaming their parents; this would have seemed a legitimate argument. They did not do this, but rather, constructed arguments to justify the necessity of actions that gave them more rather than less autonomy, something they denied themselves when talking about themselves in relation to the actions of governments or the older generation.

In attributing responsibility to the other, there may be a danger that the importance of individual or collective action is minimised (Fielding & Head, 2012). Further, their demonization of older generations – whilst understandable on one level- overlooks the fact that many adults are actively engaged in trying to address

climate change. This view may be counter-productive if it disincentivises inter-generational co-operation.

6.4.4 Reflections on conducting focus groups

Focus groups provide a means to explore the active ways that social representations are shared and the self-other are positioned in dialogue (Marková, Linell, Grossen, & Salazar Orvig, 2007). The use of focus groups enabled us to understand some of the factors that shape adolescents' representations of climate change and areas of agreement and contestation. Whereas closed-form questionnaire studies prescribe answers to questions, the direction of discussion here – though guided – was not constrained, and participants were able to express a variety of sometimes contradictory arguments. One might have inferred that if participants view meat farming as a major contributor to climate change, then they would take the position that they should not eat meat. Or that if they defend meat-eating, they would downplay its role in causing climate change. Using focus groups allows us to see these contradictory positions and the nuances of the arguments underpinning each.

Discussions in groups where participants were already known to each other flowed more easily. These groups talked and talked with one another more, with less input from the moderator. However, they were sometimes harder to follow as they more frequently went off topic. This was a small study with only five groups. Participants were all middle class and from the same local area.

6.4.5 Implications for future research, policy and practice

This research took place in early 2019. Since then, the youth climate strikes have gained momentum. It would be interesting to examine how the positioning of the self and the other is impacted by the strikes, in individuals who have and have not participated. It may be that the strikes empower the self, imbuing young people with a sense that they can make a difference when it comes to resolving climate change. Further, to explore the function of representations – acknowledged to be related to group processes (Moscovici, 1981)) – in more detail, to understand how the self – collective and individual - is served by the deployment of particular representations and self-other positions.

Regardless of whether participants linked climate change directly to themselves, they were clear that it presents a real and present danger. However, whether talking about causes, impacts, or solutions, they attributed a positive valence to the self and a negative valence to the other. In so doing, they protected the self from blame for causing climate change, protected the self from the more severe impacts of it, and attributed uncomplicated responsibility to others whilst making more nuanced arguments their own actions. Research suggests that the

communication of scientific issues should not focus on issues relating to the other at the expense of the self (Moloney et al., 2015). Communication could address the powerless self by highlighting what young people can do – individually and collectively – to resolve climate change, or the moral self by highlighting that responsibility for causing climate change cannot be distilled into simplistic attributions of blame to the other. The self could be addressed in the school curricula, perhaps by ensuring that teaching about climate change impacts is, where possible, presented in a way that reduces psychological distance.

6.5 Conclusion

In contrast to much of the literature relating to adolescents and climate change, the approach employed in this study has focused on adolescents' sense-making about climate change for its own sake. Exploring the way that self and the other are constructed in dialogue has shown the flexible and sometimes contradictory resources that are brought to bear to construct a positive self. It highlights the work required to do this, and the active and mobile nature of self-other positions. These findings have implications for future research, policy, and practice.

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Linking Text

Study 3 found that participants positioned themselves and others differently, depending on whether they were talking about climate change causes, impacts, or solutions. In all cases, more positive valence was attached to themselves and more negative valence to others. An important – and perhaps unexpected – finding of Study 3 was the anger that participants expressed about the intergenerational injustice of climate change. This anger was double-edged; they blamed governments and older generations for causing climate change – and doing too little to resolve it – and also expressed frustration at their own powerless status. This sentiment, along with the rising prominence of the youth climate strike movement in the UK and across the globe – a movement that also highlights intergenerational injustice – was the rationale and context for conducting Study 4.

Study 4 aimed to explore adolescents' – both those who had and had not attended a youth climate strike – social representations of the youth climate strike movement. Typically, this kind of research is conducted only with those participating in strikes, here both strikers and non-strikers were recruited in order to explore and identify any differences in the way both groups represented the movement and its adherents. Study 4 explored the extent to which these adolescents' social representations of the strikes are customised to align with their striker and non-striker identities. The study used semi-structured interviews with 22 adolescents aged 11 to 17 to explore their views about the movement, its likely effectiveness, decision-making about taking part in the strikes, and the behaviour and motivations of those striking.

Statement of Authorship

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Statement from Candidate	This paper reports on original research I conducted during the period of my Higher Degree by Research candidature.		
Signed			Date 01/12/20

7 Adolescents' perspectives on the youth climate strikes: An interview study with strikers and non-strikers

Abstract

The youth climate strike movement, started by Greta Thunberg in 2018, gathered pace in 2019. Due to their recency, relatively few studies have examined adolescents' views about and engagement with the strikes and those that have typically focus on only those attending strikes and include adult participants. Twenty-two interviews were conducted with adolescents aged 11 to 17. Nine participants were strikers and 13 non-strikers. Data were analysed using thematic analysis. The analysis identified areas of consensus and divergence. Regardless of their predilections and actions around striking, all participants expressed the view that climate change will disproportionately impact their generation, that the government were responsible for resolving climate change, and that their education was very important to them. However, depending on their sympathy with striking, they expressed different views about the effectiveness of strikes, the motivations of strikers, and about Greta Thunberg.

7.1 Introduction

The youth climate strike movement (known in the UK as ‘FridaysforFuture’, ‘Youthforclimate’, or ‘Youthstrikeforclimate’), may have originated with the climate strikes on November 30, 2015 that coincided with the first day of the COP21 in Paris. Although 50,000 people took part in that worldwide strike, it was probably the actions of Greta Thunberg that attracted global attention and gave the movement coherence and momentum. The then 15-year old Swedish activist began her solitary protest in August 2018: “Skölstrejk for klimatet” (“School strike for climate”), skipping school to demand the Swedish government take action on climate change (Gould, 2019). The movement has since swelled; protests in March 2019 attracted 1.6 million people across the world (Wahlström et al., 2019), and in September 2019 an estimated 6 million (Taylor, Watts, & Bartlett, 2019). Although adolescents have played a part in social movements before – such as Civil Rights and protests against American gun laws (Mattheis, 2020) – this movement is perhaps unique in being organised by young people. Of the three types of youth political dissent – dutiful, disruptive, and dangerous - outlined by O’Brien, Selboe, and Hayward (2018), this is a disruptive movement in that it challenges the political and economic status quo and works outside the system. In calling for systemic change to address the issue of climate change, it does not accept that existing power structures and relationships are inherently fixed. The movement centres on the intergenerational injustice of climate change (Hansen et al., 2013), as much as the danger it presents to the environment (Marris, 2019).

Adults publicly rebuking or criticising strikers for missing school (e.g., Leadsom, 2019; Watts, 2019) seem to be drawing on a Western framing of childhood as a period of incompleteness and limited agency, a precursor to a more complete and agentic adulthood (Toots, Worley, & Skosireva, 2014). This framing is evident in children and adolescents’ status compared to adults’ in countries such as the UK, where the voting age is 18 (GOV.UK, 2020b) and the age at which they are compelled to stay in education is enshrined in law (GOV.UK, 2020a). It is also evident in global policies and declarations on children’s rights, such as the 2015 UN resolution: ‘Transforming our world: the 2030 Agenda for Sustainable Development’ (United Nations, 2015) which contains potentially contradictory claims about agency in childhood. It calls children ‘critical agents of change’, but also defines them as a vulnerable group who need to be educated and empowered. The question of whether children are, or should be, agentic is particularly important in the context of climate change, given they are recognised to be more exposed to its future impacts (Tanner, 2010). It is important too from a human rights perspective (Lewis, 2018), if the actions of current generations limit the human rights of future generations; scientists agree that climate change presents the biggest global threat to health in the twenty-first century (Costello et al., 2009). Garlen (2019) argues for a conception of childhood based on justice rather than innocence, and notes that this would require adults to become more mindful of the rights of children and children to be more mindful of their own and others’

rights. Certainly, the strike movement exhibits strong concerns with justice for the self and others and the need for systemic change.

Taking part in a climate strike constitutes engagement in the public- rather than private-sphere; the collective championing of societal change as opposed to individual behaviour change (Whitmarsh, O'Neill, & Lorenzoni, 2013). Historically, efforts to engage the UK public in mitigating (and to a lesser extent, adapting to) climate change have focused on engaging the private-sphere rather than public-sphere (e.g., Defra, 2008). Focusing on individual behaviour may be ineffective (Lorenzoni, Nicholson-Cole, & Whitmarsh, 2007), and reliance on transformation in the private-sphere insufficient (O'Brien, 2018) to limit global warming to 1.5°C (IPCC, 2018). The impact of the COVID-19 lockdowns on emissions underline the need for public-sphere transformation; at the peak of the reduction in emissions, they were only 17% lower than on an equivalent day the previous year (Le Quéré et al., 2020); watering down 'business as usual' is insufficient. O'Brien (2018) presents an heuristic tool that outlines three interlinking spheres of transformation that span the public and private: the practical, the political, and the personal. The practical sphere represents specific actions, such as installing solar panels, improving cycling infrastructure, or reducing meat consumption. Developments here are tangible and measurable. The political sphere represents the political and economic systems and structures that constrain or facilitate the practical and is a space where the political status quo can be challenged. The personal sphere represents individual and shared understandings about the nature of climate change and solutions to it, that can influence or determine what is deemed achievable in the political and practical spheres. O'Brien (2018) argues that to meet the 1.5°C target, engagement must occur across all three spheres, rather than only one or two. In taking part in the climate strikes and directly challenging those in power, young people are occupying a new space within the political sphere.

Given their recency, there has been limited opportunity for empirical work relating to the strikes and to our knowledge, no study that engages solely with adolescents, defined as a period between childhood and adulthood that spans 10 to 19 years (WHO, 2020). One study analysed five of Greta Thunberg's speeches to characterise children's protest in relation to the climate emergency (Holmberg & Alvinus, 2020). They found two themes: need for political and social change and resistance targets. Another study examined strike participants' support for three frames: environmental, economic growth, and welfare (Emilsson, Johansson, & Wennerhag, 2020). The age range of these participants was very broad, with only 24% being under 19. Participants prioritised the environment over economic growth, but not necessarily over concerns about welfare. A large study (Wahlström et al., 2019) surveyed strikers and conducted a smaller number of short interviews in 13 European cities – including two in the UK - during a protest on 15 March, 2019. Almost half of participants across the countries were aged between 14 and 19 (the remainder were adults, and they did not survey anyone under 14 because of

ethical concerns about obtaining consent). Two thirds of participants were female, and many were first-time strikers. Overall, participants indicated they felt more 'worry' and 'anger' than 'hopelessness' when thinking about climate change. The involvement of their peers mattered to school students and schools appeared to have been active recruiting grounds. Just under half agreed that Greta Thunberg had influenced their decision to take part in a strike. The activists identified with instrumental motivations for striking – such as 'pressuring politicians to make things change' and expressive motivations – such as 'to express myself'.

These researchers noted a disparity between their own observations and the nature of the press coverage of the strikes (Wahlström et al., 2019). In their Manchester and Truro case studies, where they reported peaceful, joyful atmospheres and higher numbers of strikers, the press focused on the problems caused by striking. The media in Truro reported fewer participants and incidents of egg-throwing. Similarly, in Manchester, the researchers reported speeches, slogans, and vibrant 'climate justice' chanting, whereas The Manchester Evening News focused on the strikers' blocking of public transport. Another disparity – discussed by Bowman (2019) – is that although Wahlström et al. (2019) described joyful, festival-like scenes at the strikes, and it is established that participating in collective action can elicit positive emotions (e.g., Blanco-Ramirez, 2018; Neville & Reicher, 2011), their study gave little consideration to participants' positive emotions. Rather, they were invited to respond to negative frames, to questions about anxiety, anger, and hopelessness. The study – as in wider collective action literature (e.g., Klandermans, 2004) – distils to binaries: to instrumental or expressive motivations. Bowman (2019) echoes the reference to binaries: action that targets policy makers and action that is expressive, action that is political and action that is not, a person who is engaged, a person who is not. Binaries are also evident in some of the media coverage of strikes and strikers, where climate striking is pitted against the moral imperative of education (e.g., Times Educational Supplement, 2019).

The current study presents an inductive analysis of in-depth interviews with 22 British adolescents aged 11 to 17 about the climate strikes. Our study is novel because we focus exclusively on adolescents and do not include adults. Rather than focusing on only strikers, we include both strikers and non-strikers to elicit a range of views about the strikes. We use semi-structured in-depth interviews to understand participants' own voices and perspectives. Our research question is: How do adolescents conceptualise the youth climate strikes?

7.2 Method

7.2.1 Design

The study employed a qualitative cross-sectional interview design. Ethical approval was granted by University of Bath in July 2019.

7.2.2 Procedure

The study was advertised through local online message boards. Parental consent was obtained for all participants under the age of 16 prior to their interview. Interviews were conducted at participants' homes or on University premises and lasted between 35 minutes and one hour. At the start of each interview, participants were given an information sheet and asked if they had any questions. Then they provided their consent (if over 16) or assent (if under 16). A semi-structured interview schedule was followed. This included questions about the nature and aims of the strikes, participants' own and others' decision-making about participating. They were also asked about the responses of their schools, parents and, for those who had attended a strike, what their experience had been like. Participants were also invited to make any other comments they wished. At the end of each interview, participants read a debriefing sheet and were asked if they had any questions. Finally, they were given a £10 voucher to thank them for taking part.

7.2.3 Participants

Twenty-two participants aged 11 to 17 were recruited. The interviews were conducted in October and November 2019. Nine participants had attended one or more strikes (strikers), 13 had not attended a strike. Of these 13, six participants had wanted to strike but were not able to (would-be strikers) and seven had not wanted to strike (non-strikers). The participants lived in a number of locations: a large city, a small city, two small towns, and a village in the south west of England. One participant was home-schooled, 20 participants attended one of their local schools and one a further education college. All participants have been given pseudonyms. A summary of participants is shown in table 1.

Table 1. Summary of participants – Pseudonym, Sex, Age, Striker status (striker = S, would-be striker = WBS, non-striker = NS)

Pseudonym	Sex	Age	Striker status
Neo	M	12	S
Esme	F	13	S
Yannick	M	12	S
Shura	F	17	S
Matt	M	13	S
Alex	M	13	S
Natalie	F	16	S
Eric	M	12	S

Olivia	F	15	S
Emily	F	11	WBS
Sophie	F	12	WBS
Ellie	F	13	WBS
Ryan	M	13	WBS
Finley	M	13	WBS
James	M	11	WBS
Amy	F	13	NS
George	M	17	NS
Ed	M	15	NS
Tina	F	17	NS
Nicky	F	14	NS
Rachel	F	16	NS
Rob	M	13	NS

7.2.4 Analysis

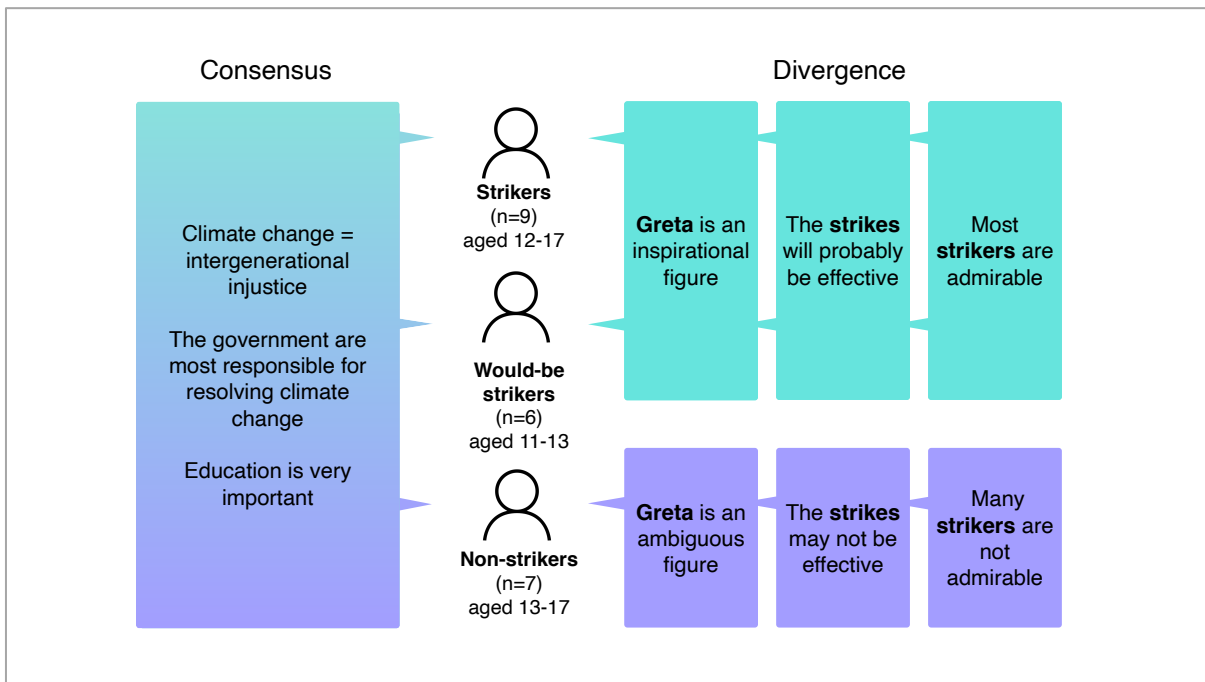
The interviews were audio recorded and transcribed verbatim. A total of 216 pages of interview data were analysed using thematic analysis (Braun & Clarke, 2006; Braun & Clarke, 2020), to identify patterns of meanings and similarities and differences across the dataset. An inductive thematic analysis approach was taken (Braun & Clarke, 2013); the data were examined without pre-existing conceptions or the imposition of existing frameworks. Data were first coded, codes grouped, finally grouped codes were brought together into themes.

7.3 Results

On the basis of their explanations about their choices or experiences on strike days, participants were first categorised into three groups: strikers, would-be strikers, and non-strikers. Nine strikers spoke excitedly about their experiences at strikes, variously calling the atmosphere *'electric'*, *'euphoric'*, *'really super friendly'*, *'great vibes'*, *'almost like a festival'*. They became more animated when talking about striking, which seemed to have been something of a revelation for them. They alluded to feeling empowered by striking and to a sense of connectedness from being amongst like-minded others. Six would-be strikers expressed an interest in striking but had not so far been able to. This was either because their parents had not given them permission to go, or because they were worried about their schools responding punitively. These participants were all aged 11 to 13, so it is perhaps unsurprising that they were or felt more constrained than some of those in other groups. They expressed some disappointment – along with resigned understanding and acceptance – about not being able to strike. Finally, seven non-strikers prioritised being in school over striking. They acknowledged the importance of taking action on climate change but were unhappy with the prospect of striking during school hours.

Despite their different experiences, all participants were supportive of three propositions: climate change will have a disproportionate and unfair impact on their generation, the government are mainly responsible for resolving climate change, and education is very important. Clear differences emerged when participants spoke about Greta Thunberg, the effectiveness of strikes, and the motivations of some strikers. Here, strikers and would-be strikers were aligned, whereas non-strikers articulated different or opposing positions. A diagrammatic representation of the topics of consensus and divergence is presented in figure 1.

Figure 1. Striker status, topics of consensus and divergence



7.3.1 Areas of consensus

Independent of their actions around striking, participants talked as one about the intergenerational injustice of climate change, governmental responsibility for resolving climate change, and the importance of their education.

7.3.1.1 Intergenerational injustice

Strikers were perhaps most vehement when expressing their anger at the intergenerational injustice of climate change, with their anger taking the form of moral outrage. Here, Olivia is explicit about the impact on her generation, brought about and exacerbated by the selfish actions of older generations:

I: So what made you, what was the particular reason for, for going? I mean, I suppose you might have just said that really but...

O: Oh, um, I think it's because, well, it, my generation are at the moment is going to be the most affected by climate change and right now the government is controlled by, I don't know, people, middle-aged men who are making money off selling fossil fuels and stuff like that and they don't care about our future and generations to come. So I wanted to make a stand and try and do something about that (laughs).

I: Yeah. And do you think that, it's interesting you should say that, do you think that they don't really care?

O: Mmmm, the majority of them no, I don't think they care because they're making millions and millions of pounds off fossil fuels. And fracking. And I don't think that a few, like they're gonna be dead by the time that climate change has actually affected people, so like in this country, so I don't think that they really want to believe that it's actually happening. So.. yeah.

Olivia, 15, striker

That climate change presents a bigger threat to their generation than previous ones was a narrative universally articulated. Here, James notes that climate change will not only impact his generation, but subsequent generations too. He does observe that it may present an issue for his parents' generation, but caveats that if this is so they will be 'quite old', and in so doing, underlines his point that his generation will be more affected than previous:

I: Um, so why do you think that people are taking part in the strikes?

J: Um, because it's like, it's, it's sort of our generation that will be affected. So, we don't want that really to happen. Cos it will be us that get like the worst of it.

I: Yeah. And when you say 'our generation will be the most affected', do you think that that means that other generations won't be affected?

J: No, like generations after us might be

I: Yeah

J: Um, and maybe mum and dad's generation, like but when they're quite old
James, 11, would-be striker

Non-strikers may have chosen not to strike but they too clearly and strongly expressed the view that their generation was going to be disproportionately impacted by climate change. Here, Ed explains that it is unfair for politicians to cast aspersions on strikers, given they are more likely to face more severe impacts of climate change:

E: Um, I think, it would be easy for people who aren't affected as much by the climate crisis to just see it as a kind of fad and for some people it is just a fad. You know. Um (pause), no, I don't think that's fair really because like (pause) as my generation is probably the generation that will be affected most by

climate change, um, we should have the right to actually, you know, have a say, I guess.

Ed, 15, non-striker

There was no sense when discussing this issue that it was one with two ‘sides’, that could or should be debated. Rather, intergenerational injustice was presented as an incontrovertible truth; their generation would be more affected by climate change than previous generations, this was profoundly unfair, and it gives them the right to be heard.

7.3.1.2 Governmental responsibility for responding to climate change

Participants suggested that the main intended audience for the strikes was the government – who were currently doing too little – exemplified here by Rachel:

I: Okay. And so what do you think that the strikes are meant to achieve?

R: Well, obviously some change in how the government is treating climate change as a, as a, as an idea, as a thing that they have to stop and prevent. Because currently they don't seem to have much action that they're doing it against it. So it's obviously trying to influence their ideas to be like 'people care about this, change it'. That kind of thing.

Rachel, 16, non-striker

Most participants intimated that the strikes should ‘persuade’ or ‘show’. Here Matt suggests that the goal is to ‘annoy’ the government into action. Perhaps this choice of verb reflects a common tactic used by adolescents to persuade their parents. By highlighting that the strikes speak to government, the government is positioned as responsible for resolving climate change:

I: Yep. And so what do you think the strikes are meant to achieve?

M: Well, they're like (pause) they're annoying people into doing something. So like, we're not going to stop until you give us what we want.

I: Yep. That's an interesting word – annoying. So in other words, they are deliberately annoying, do you think?

M: Mmmm hmmm

I: And who are they trying to annoy?

M: Like parliament and stuff like that.

Matt, 13, striker

Some participants stated explicitly that there is little they can do as individuals to make a difference. Allusions to their own powerless status and their limited individual ability to make a difference served to highlight the responsibility they placed upon the government to resolve climate change.

7.3.1.3 Importance of education

Whether or not they had gone or wanted to go to a strike, participants stressed they were concerned about doing well at school. The seven non-strikers gave their education as a reason for not striking. For them it was not necessarily that protesting was unimportant, but rather that being in school was more so. Here, Ed explains that although he recognises that climate change is more important than just his education, his chances of making a difference in the longer-term may be higher if he stays in school:

I: Well, so you would like to go but you don't want to miss school to go?

E: Yeah. I guess so. Yeah. I mean, of course the climate crisis is a lot more important than just my education but I think having hopefully, having the ability in the future to be able to make a difference as an educated individual. As educated as you can get from the school system (laughs) than just being one extra person in the crowd. I, you know, hopefully I can make a big difference by having a degree or whatever. Yeah.

Ed, 15, non-striker

Strikers and would-be strikers also said that their education was very important to them. For strikers, choosing to strike did not reflect any lack of concern about their education, but a balanced decision that striking could be prioritised over school for half a day. However, the choice between education and striking was not static, rather prioritisation of one over the other was dependent on context. Here, Shura, who had attended several strikes, explains that she is coming to a point where her education must come first:

I: So do you think you are going to go on future strikes?

S: I think honestly as it's drawing nearer to my exams, probably not until after July, June or July, but I want to be and I want to be there in spirit and I want to support around it as much as I can. And after that, well I'm probably having a gap year so I'll go then.

Shura, 17, striker

Similarly, Ryan, who had wanted to strike but had not been allowed to by his parents, explained that frustratingly, the time for him to strike would be now, rather than in a year when he would be starting his GCSEs in earnest and would need to be in school more than he does now:

I: And what do you think, you know, if they are still going on next year when you are in year 10, do you think it might be different then, that you might be able to, or...?

R: Yeah, cos with my GCSEs coming up, it might be a bit more different because it would be my education, it would be like more serious because, er, the stuff that I'll be learning I will need for my GCSEs and like, so I might need to know

that more than what I'm learning now, because, yeah... Especially cos right now some of the subjects that I'm like learning I'm probably not going to take for GCSEs so it's like (pause) er, I don't really need to (pause) know that because I'm not going to take a GCSE on it...

Ryan, 13, would-be striker

7.3.2 Areas of divergence

Participants expressed contrasting views about Greta Thunberg, the effectiveness of strikes, and the motivations of some strikers. Here, strikers and would-be strikers articulated similar positions, whereas non-strikers presented opposing narratives.

7.3.2.1 Greta Thunberg

Strikers and would-be strikers' talk about Greta Thunberg was entirely positive. Many referred to her early on in the interview and without prompting and some directly appropriated her language, such as when Esme asked: '*what's the point of school if you don't have a future?*'. Neo said he had gone to a strike after watching a video of Greta. Others, like Emily, described her as a positive and inspiring role model who was standing up for her beliefs:

I: And what do you think about her?

E: I think it's really good what she's doing. Cos, er, she's kind of start, erm started the (pause) kind of moving forward a bit because, er, she's standing up for what she believes in, which, and everyone is thinking 'well if she can do it why can't we?'. So, yeah.

Emily, 11, would-be striker

Non-strikers did not typically mention Greta spontaneously and when they did talk about her, they did so with much less enthusiasm. Although they did not speak about her in solely negative terms, often prefacing criticism with something appropriating praise, the portrayal of Greta by non-strikers was at best ambiguous, as in this example from Amy:

I: And do you know who Greta Thunberg is? Do you think, what do you think her role is? And do you think she is a force for good, or not?

A: Mmmmmm. I think, I think she is getting somewhere because I know that there have been a lot of media coverages and things. I think what she's, um, going for is right but, but there are also like... I don't know! Like, um, like things that also seem very (pause) like it is, there's only one, one right to this...

I: Okay. So a bit single-minded?

A: I think what her, her perception of, I don't know a huge amount on this, I think her, the way in which she is going is a bit (pause), it's a but um, like

striking fear. Which is, which is another way to go but personally I don't think that would be the ideal way to go.

Amy, 13, non-striker

Amy's suggestion that Greta's actions indicate there is only one right side and her comment that it is the not 'the ideal way to go', seem to suggest that there is therefore an alternative argument and course of action to Greta's, perhaps that a message of hope might be more effective than one of fear. She seems to be saying that Greta's viewpoint is too narrow and that her behaviour could be counterproductive. In a similar way, Ed's portrayal of Greta is abstruse:

I: And do you think she's kind of a positive face of all of this?

E: Yeah. Yeah, she is, um, I think she's a good role model to like, erm, represent um, climate change, well, not climate change, but you know, um being environmentally friendly. Um, I think (pause) I guess because she's kind of, I guess she's kind of volatile, not really in her personality but because she's a young girl and because she's quite... she's not very like normal in the way she speaks, um, she's quite easy to make fun of. So if somebody was slightly more like, you know, had less regard for the environment I think she, in her, in just the way that she presents herself and speaks, you know, not being specific, I don't know how to put it but like a lot of kind of political figures they're not quite stable in the way that they speak but Greta Thunberg almost seems like not the average celebrity I guess. So a lot of people make fun of her a bit. But I think, yeah, she's a positive face for change, erm. Yeah.

Ed, 15, non-striker

In this quote, Ed moves between praise and critique. He credits Greta with being a good role model, but immediately follows this by saying she is 'kind of volatile', and 'not very like normal in the way she speaks'. He describes her as someone other people make fun of. Finally, he answers the question and says that she is a positive face for change. Both Amy and Ed are equivocal, they seem to be trying to tread carefully and are reluctant to explicitly criticise Greta, but it is clear they do not wholeheartedly support her.

7.3.2.2 Effectiveness of strikes

Strikers and would-be strikers expressed hope that the strikes would be effective and could envisage that this would be so. Effectiveness was mostly conceptualised in terms of persuading the government to take action, although convincing broader publics that climate change will affect everyone, that it's not just an issue affecting 'crazy hippy vegans', as Natalie observed, was also considered an aim of the movement. Some noted that the government had already declared a climate emergency, others drew on small, local changes now being implemented that could develop over time into large-scale changes, a process Matt called 'a butterfly effect'. Similarly, Shura hoped that small changes would precipitate big change:

S: Impact. I want change. It's making a change. Already (city council) has come up with, I can't remember how many propositions they got given at one of the strikes and they've already had a response to each of those propositions and they're already having impact on each of those. And if that's the same for every small council then that would be a big change nationwide. And then if it's the same in every country then that will be a big change worldwide.

I: So really, the movement, the way it will work is by affecting local, that then becomes global?

S: I think so. Because, well, it's certainly working in our area and I know it's working in some of my relatives' areas as well. Cos obviously in some like obscure places they might not do strikes but (pause) I feel like it will. It's like a domino effect, it will like trickle in and there will suddenly be a big change. But. Yeah. That's what I hope for.

Shura, 17, striker

Non-strikers were much less certain about whether the strikes would effect change. George observed that thus far the strikes appeared to have achieved little and – whilst they could play a part – would not be the ultimate catalyst for change. Others wondered whether striking was ‘enough’; Amy took issue with them being passive, noting that whilst they are ‘*in the right spirit*’, they are not ‘*active*’. Similarly, Ed wondered whether the people striking should combine it with ‘*doing something more than just banging drums*’, such as a litter pick. Nicky observed that ‘*all they're doing is just stood there*’. Tina took a similar position, suggesting that ‘*just walking around with little cardboard*’ is not action. She referred to her experience of living in South Africa, and the strikes she had seen there:

T: But like, I know strikes don't really make a difference if that makes sense.

Um, yes, they bring lots of attention to the thing but often the government just kind of passes it on. They don't really pay much attention to it. So going and putting in all the effort for it and it doesn't really give a good result.

I: Mmmm. What strikes can you think, can you think of when you say you know they don't really achieve anything, is that because you know..?

T: Because a lot of people in South Africa also strike, they don't strike for climate change, but I know, I've seen lots of people walking around with like notes and shouting and singing and stuff, as we do there, but, erm, it never changed anything

I: No. Why do you think it doesn't change anything, just out of interest?

T: Because the government has bigger problems than just to worry about what a small amount of people want. And they'd rather do bigger things than worry about these sort of people who are asking for something.

Tina, 17, non-striker

Tina did not say what the aim of the South African strikers was but draws a parallel between the strikes there and the youth climate strikes in the UK. The words she

uses at the end of this section are perhaps revealing; that the government have more to worry about than what a 'small number' want. By suggesting that the numbers are small, she seems to imply that the movement is on the fringe and referring to strikers as '*these sort of people*' appears pejorative. Within this framing, the strikes are presented as rather trivial and having little chance of success.

7.3.3 Strikers

Strikers and would-be strikers explained the majority of strikers' reasons for participating in simple terms; they are striking because they care about the environment and their future and want their voices to be heard. They acknowledged that some people going to strikes were doing so because they wanted to miss school and did not condone this, most suggested that not caring about your education is comparably ignorant to not caring about the planet. However, these people were held at a distance, 'people' rather than friends, a relatively small number of outliers. Many, like Natalie, took the view that even if their motivations were not admirable, those skipping school were nonetheless helping the cause:

I: And one of the reasons that they've kind of given for that is cos they think that a lot of people are going on the strikes effectively to miss school.

N: I think that is an aspect of it (laughs). I think there's definitely something like, you know, it's like you know 'ooh, we have a genuine reason to just not go to school!'. But I think if (sigh) I mean as much as I do think people should be doing it for the cause of the whole climate emergency thing, which is terrifying and people should absolutely care about, I think if people are going for the sake of missing school, they're still going. They're still helping the movement and I don't agree with the motives, because I think, you know, you should care about your education in my personal opinion, but (pause) I, I'm not against entirely people doing that just cos it's like, oh. Whatever. Because it's still helping.

Natalie, 16, striker

Non-strikers praised some strikers for acting on their beliefs but in general spoke about strikers rather more negatively. Ed distinguished between those who were '*doing something quite formulative and educational*' (who should not be punished by school for striking) and those who were going to McDonald's (who should). There were suggestions that some strikers had been subjected to peer pressure; Amy joked that the movement was a '*cult*'. More generally, non-strikers categorised strikers into two groups: the pro-environmental striker (sometimes simply noble but sometimes *too* pro-environmental), and the more reprehensible 'skiver', who was using the strikes as a means to skip school (some to engage in categorically un-environmental and therefore doubly hypocritical behaviour such as going to McDonald's). In positioning these groups at the poles, non-strikers were able to place themselves in the middle ground. Here, George, who had earlier talked about

a friend ('a judgemental vegan') who had tried to persuade him ('a complete meat eater') to go to a strike, explains his desire to occupy a moderate position:

G: I tend to sort of keep my nose out, um, cos I'd rather remain, more neutral, it's a bit complicated, cos, um, if I was to be too pro then I might seem a bit (pause) 'weirdy', but if I was a bit too 'oh, I don't really care', then that's a bit...

I: Mmmm. So when you say that if you were a bit too pro you'd seem a bit weirdy, what do you mean by that?

G: Well, um, I'm not really sure (laughs)

I: That's alright!

G: Um, like a bit 'environmentalist'. There's nothing wrong with that, it's just, it might seem slightly different to the average person, who gets the bus every day, or, um, er, has a car. Instead of like going to, um, the strikes, and cycling, walking everywhere, yeah. I'm not really sure how to describe it.

George, 17

Tina also placed herself between two groups in her class, the 'rebel-looking lazy ones', who were skivers, and the 'hippies', who went to the strikes. She did not identify with the 'hippy' group but credited them with principles; in a discussion about a hypothetical out of school hours tree planting session she said that she was sure that they would take part (as, she said, would she). In her view, the skivers would not, because they do not really care about the planet, this lack of a concern about anything that matters, a product of their 'cool' identity. This cool (or sometimes 'naughty') skiver – to which other negative characteristics, such as not working at school or smoking were tied – was one that strikers were particularly keen to distance themselves from:

I: Do you think that's true then, it's not cool to care about the environment?

T: No I don't, it's something that you live on and something that you should care about.

I: Sure. But do you think that these people....?

T: I just think they are stupid for not caring to be honest (laughs)

I: Do you think it's all wrapped up in their kind of 'cool' identity?

T: Yeah. Well they smoke, they're basically ruining their insides and they drink and, I don't know. I don't understand. Being stupid as well is also 'cool'. But it's just, you're ruining your life just to be cool for the like 20 years when you're young and then when you're old you're poor and working as a janitor or something like that.

I: Yes, perhaps a bit short-sighted. I don't understand how they can afford to smoke, but that's another issue!

T: Some of them steal!

I: Oh!

T: (laughs) It's stupid

Tina, 17

Although they expressed scepticism about and disapproval of the motivations of a swathe of those participating in strikes, non-strikers acknowledged that they benefited the strike movement because irrespective of motivation, their absence from school would be counted as strike attendance.

7.4 Discussion

This paper presented an analysis of 22 in-depth interviews with adolescent strikers and non-strikers aged 11 to 17 in the south west of England. We identified three groups – strikers, would-be strikers, and non-strikers – on account of their different choices about and experiences of strike days. We then highlighted three areas of consensus: intergenerational injustice, governmental responsibility, and the importance of education. Then, three areas of divergence, where strikers and would-be strikers presented very similar views and non-strikers opposing ones: Greta Thunberg, the effectiveness of strikes, and the motivations of strikers. Despite their differences, participants were as much united as divided. All expressed their support for the principles underpinning the strikes, even if they did not all support striking and strikers.

Information in the mass media seems to have had some kind of agenda-setting effect on their representations of the strike movement (e.g., Happer & Philo, 2016; Joffe, 2003). On the face of it, this could be interpreted as evidence of participants receiving and then re-presenting others' arguments. However, although participants articulated particular arguments in support of their own stance towards striking, they were aware of and sometimes sympathetic to opposing perspectives. In putting forward their own positions on the strikes, strikers and would-be strikers aligned themselves with the narratives put forward by Greta Thunberg, often quoting or paraphrasing her. In contrast, some of the arguments put forward by non-strikers were akin to some of the anti-strike rhetoric seen in the media. This was particularly evident in the way they talked about Greta Thunberg as an ambiguous figure (e.g., Harrison, 2019; Petter, 2019). They rejected simplistic binaries; irrespective of their perspective on striking, they did not position striking and strikers as simply good or bad, right or wrong. Strikers were not so rigid about the righteousness of their cause that they could not empathise with those it inconvenienced or be critical of the motivations of those appropriating the strikes. Would-be strikers expressed an understanding of the reasons why they had been unable to go to a strike. Non-strikers were not engaged with the idea of striking but were engaged with the issues the movement seeks to highlight. All emphasised that taking action on climate change and getting a good education are both vital. Other studies exploring children and adolescents' political activism seem to focus on the perceptions of those taking part in the activism, rather than on the views of those not participating. However, there are similarities between the protesting participants in this study and those protesting in the same timeframe against the government in Thailand (Lertchoosakul, 2021) and child marriage in Bangladesh (Tisdall & Cuevas-Parra, 2020). Like the

participants in this study, these participants shared a grievance against the powerful for perpetuating injustice and a common identity with other protesters.

One proposition could be that views about striking are a factor of age, that older adolescents are simply more pre-disposed to certain views than younger and vice versa. Certainly, it would appear that age was a factor for the would-be strikers (11-13), who were either not given permission to strike by their parents or were worried about penalties for striking being meted out by schools. However, age does not seem to have been a factor in decision-making about attending or not attending strikes as the age range of strikers (12-17) and non-strikers (13-17) was similar. It would be fair to say that older participants – as might be expected – were perhaps more confident in expressing their arguments than younger participants. However, it was the fundamental content rather than the sophistication of argument that determined which group they belonged to. In whatever way they expressed themselves, strikers across the age range articulated very similar views about Greta, effectiveness of strikes, and strikers, as did non-strikers. Further, there was no evidence here of an ‘adolescent dip’ (Olsson & Gericke, 2015; Otto, Evans, Moon, & Kaiser, 2019) – a reduction in concern about environmental issues between 14 to 18 years old – since all participants of all ages expressed strong concern about climate change and its potential impact on their generation.

Taking part in a strike was in and of itself a positive experience for the strikers. Like Wahlström et al. (2019), strikers described the atmosphere at the strikes as joyful, friendly, and festival-like. Striking seemed to have given the strikers the opportunity to feel they were part of an effective movement and to engage with like-minded others. Arguably, the experience was educational (or ‘formulative’, as Ed called it) in a broad sense, fostering self-efficacy and a sense of inclusion (Whitmarsh et al., 2013). Although it may be almost impossible to trace precise outcomes of a social movement given they occur within broader societal contexts (Nissen, Wong, & Carlton, 2020), it is feasible that in addition to having a positive impact on strikers in the here and now, benefits could extend to wider groups and into the longer-term. Participating in civic action at a younger age leads to higher levels of civic engagement throughout the life course (Oesterle, Johnson, Mortimer, 2004). Further, young people are known to influence both their peers (Fisher, 2019; Fisher, 2016) and their parents and wider families’ climate concern and behaviour (Bloemraad & Trost, 2008; Lawson et al., 2019).

7.4.1 Strengths, limitations, and future research

Whilst research into civic action tends to include only those participating (e.g., Wahlström et al., 2019), we engaged with both strikers and non-strikers to understand the positions they held about the strikes and their choices about participating. A qualitative in-depth interview design with open-ended questions did not prescribe responses or binaries, but enabled participants to express a range

of possible positions. The participants here did not focus only on the instrumental or expressive, seemingly concerned with awareness-raising and movement-building as well as with convincing the government and expressing themselves (Hornsey et al., 2006). One limitation – and an ethical necessity of conducting research with minors – is that recruitment of under 16s was facilitated through parents rather than participants themselves. Having parents as gatekeepers meant that only participants whose parents had engaged with the recruitment process could engage with the study, precluding others who may have wanted to participate.

One potential avenue for future research would be to conduct similar studies across different parts of the UK and internationally to understand how other groups of adolescents conceptualise the strikes. Another would be to examine non-strikers' reasoning for not striking, given that they are strongly engaged with the issues underpinning the strike movement. They gave the importance of their education as a reason for not striking, but some of their comments – particularly around the efficacy of strikes – indicated real cynicism about the possibility of achieving change. This could perhaps be a reflection of their underlying views about or faith in democracy (Šerek & Lomičová, 2020), or feelings of powerlessness or hopelessness (Ojala, 2012a, 2012b). Studies with longitudinal design would be useful for extending our understanding of whether and how participation or non-participation in the strike movement changes over time. Finally, Covid-19 may have impeded large physical strikes for now (LSE, 2020), but communication has continued online on platforms such as Twitter or Instagram. Understanding ways of communicating and protesting online is important, and moreover, would be a feasible undertaking for researchers during the course of the pandemic.

7.4.2 Wider implications

These participants articulated the same fundamental position: climate change is a serious issue, we as a group are more at risk and should therefore be listened to, action and change is needed. This reflects material reality; adolescents are likely to face more severe impacts of climate change than the generations currently making political decisions on their behalf (Sanson & Burke, 2020). They are stakeholders in their future but not decision-makers about their future. Given this, considering ways to facilitate increased political representation and expression seems a moral imperative. One obvious way to do this would be to lower the voting age in countries such as the UK (Electoral Reform Society, 2020).

Participants' familiarity with and articulation of the concept of intergenerational injustice could be because the injustice is simply self-evident to those on the end of it, or because a key communication of the strike movement has resonated. However, although the impacts of climate change on young people and future generations are acknowledged and discussed in academic literature (e.g., Hansen et al., 2013), intergenerational injustice does not feature heavily in media

reporting (Graham & De Bell, 2020). More prominent coverage in the media might be constructive, as highlighting the impact of climate change on identifiable future others (children or future grandchildren) may increase salience and promote increased consideration amongst adults of the interests of future generations (Markowitz & Shariff, 2012).

Last, climate change in the school curricula – which begins formally in the UK around the second or third year of secondary school (Department for Education, 2014) – focuses more on the physical climate system and is taught in Geography and Science. Teaching about climate change could feasibly occur earlier and within other subjects, to help contextualise it as a social as well as environmental issue. This may help to engender the critical thinking skills required for societal transformation on climate change (O'Brien et al., 2018), and potentially foster climate activism. Learning about and participating in climate protest could strengthen democracy in the longer term (Hytten, 2016) and make the consideration and redress of generational inequity a more viable proposition.

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8 Discussion and Conclusions

In this chapter, I revisit the aim of this research and provide a brief summary of the work conducted to address this. I outline the contribution to knowledge that this work has made by synthesising the key findings and delineating methodological insights. I consider the limitations of the research and possibilities for future research. Finally, I discuss the potential implications for policy and practice.

8.1 Research aim and summary of findings

The aim of this thesis was to capture, describe, analyse, and understand adolescents' representations of climate change. To meet this aim, the following research was conducted:

First, a systematic narrative review (Lee, Gjersoe, O'Neill, & Barnett, 2020), presented in Chapter 3, was undertaken to examine what is already known about children and adolescents' understandings of climate change. The study included 51 international studies including participants aged eight to 19. The focus of most of the included studies was the accuracy of participants' scientific knowledge about and support for particular solutions to climate change. Quantitative methods were dominant, with closed-form surveys common. Concern about climate change and support for actions to resolve climate change was lower amongst participants in the UK than in many other countries.

In the majority of the reviewed studies, the focus of the research was accuracy of participants' knowledge and their reported willingness to support particular actions. With the parameters of this research set by researchers, and response options typically limited to likert scales, there left little scope for participants in these studies to express what interested them about climate change. Therefore, the aim of Study 1 was to elicit adolescents' spontaneous responses to climate change in order to understand what aspects of climate change were most readily available to them when they were not prompted to focus on specified aspects of climate change. A free association study was conducted with 384 participants aged 11 to 15. Twenty-three response categories were identified, with almost all referring to consequences of climate change. Elicitations relating to 'heat', 'ice melting', 'weather' and 'animals' were most common, with some responses alluding to 'disaster'. The findings indicated that older adolescents (aged 13 to 15) appeared to have integrated more complex and scientific ideas into their representations of climate change than younger adolescents (aged 11 to 13), who focused more on animals, particularly the polar bear. The findings were suggestive

of all participants locating many of the more specific and serious impacts of climate change at a distance from themselves.

In view of this apparent tendency to situate climate change at a psychological distance, the aim of Study 2 (Lee & Barnett, 2020) was to examine the extent to which adolescents considered climate change proximal or distant across the four key dimensions (spatial, temporal, hypothetical, and social). Study 2 presented an analysis of questions asked of scientists about climate change by 10- to 12-year-olds in an online 'climate zone'. Their questions were coded deductively (according to the four key dimensions of psychological distance) and then inductively (to identify interesting patterns in the data not attributable to the deductive codes). The questions were categorised into themes relating to the reality and nature of climate change, its causes, current and future consequences, and solutions. A number of questions alluded to consequences and solutions analogous to science-fiction. The findings suggested that participants positioned climate change as both a proximal and distant phenomenon. Participants' questions indicated that they viewed climate change as spatially distant and temporally and socially proximal and distant. Some questions contained explicit or implicit scepticism about climate change, suggesting that for a minority of participants, climate change is hypothetically distant.

In order to explore further the apparent psychological distancing of climate change identified in Studies 1 and 2, five focus groups were conducted in Study 3 with 22 participants aged 11 to 14, to explore where and how they position climate change in relation to themselves and others. The 'self-other' theme – a concept relating to the functional and identity-protective nature of social representations – was used as a framework to analyse participants' talk about climate change. As in Study 2, the data were coded first deductively (according to the positioning of climate change in relation to the self and / or other) and then inductively. Participants associated climate change with themselves and others differently, depending on whether they were talking about climate change causes, impacts, or solutions. A variety of others (principally and most categorically China) were deemed responsible for causing climate change. The more serious and dangerous impacts of climate change were placed with others, more benign or pleasant impacts (such as warmer summers) with the self. Others were deemed to have evident responsibility for resolving climate change, whilst participants' arguments about their own responsibility were more nuanced. These adolescents expressed considerable anger at the intergenerational injustice of climate change. They were angry with older generations and the government for causing and perpetuating climate change, and for doing too little to resolve it. This anger was amplified in the context of their own powerless status, particularly their inability to vote.

Finally, to explore the anger about intergenerational injustice observed in Study 3 in the context of a burgeoning youth climate movement that sought to highlight that injustice, Study 4 examined the ways that adolescents represent the climate

strikes, their likely efficacy, and those participating. Twenty-two semi-structured interviews were conducted with 11- to 17-year-olds who had and had not participated in a climate strike. Irrespective of their actions or predilections around striking, all participants indicated that climate change was an issue of intergenerational injustice, that the government were mainly responsible for resolving climate change, and that their education was very important to them. However, depending on whether or not they were sympathetic to striking, they expressed markedly different views about the effectiveness of strikes, the motivations of strikers, and about Greta Thunberg.

8.2 How do adolescents represent climate change?

In this section, I draw on the body of research reported in this PhD and return to Social Representation Theory (SRT) as a lens through which to consider the findings of this research and how they have contributed to addressing the overall aim. I discuss five aspects of these adolescents' representations of climate change. First, I consider the types of representations they may be sharing. Second, the possible function of their representations. Third, the processes of their representations: anchoring and objectification. Fourth, the potential implications of their representations for action. Finally, I make some tentative observations about potential age-related differences in their social representations.

8.2.1 What types of social representations are they sharing?

There are three types of social representations: hegemonic (widely shared); emancipated (the property of sub-groups); and polemic (the product of struggle in society) (Moscovici, 1988). These adolescents' held representations that could be categorised as hegemonic and polemic.

8.2.1.1 Climate change is real and anthropogenic: a hegemonic representation?

Taking the findings of the empirical studies together, it is clear that these participants share a hegemonic representation of climate change as a real, anthropogenic phenomenon. Although there were a relatively small number of questions in Study 2 (Lee & Barnett, 2020) relating to aspects of the reality of climate change (is it real, human-caused, or all bad? (Rahmstorf, 2004)), the vast majority of the questions asked were predicated on the assumption of a real and anthropogenic climate change. There was no evidence of uncertainty about climate change or its human cause in the studies presented in Studies 1, 3, or 4. On the rare occasions that climate sceptics were mentioned or discussed in the focus group and interview studies (Donald Trump being the chief exemplar), they were treated as aberrations. Their conviction and concern about climate change is likely reflective of increasing concern in the UK population generally (Eurobarometer,

2019), with concern higher amongst younger adults than older (British Social Attitudes, 2018). That climate change is real and anthropogenic appears therefore to be a hegemonic representation.

8.2.1.2 Climate change as an issue of intergenerational injustice: a polemic representation?

Added to their representation that climate change is a real and threatening phenomenon was the notion that it presents a far more serious threat to young people like them than to older generations. The concept of intergenerational injustice is discussed in academic literature (e.g., Hansen et al., 2013; Robinson & Shine, 2018; Sanson & Burke, 2020; Schlosberg & Collins, 2014) and ensuring climate justice and equity is one of the key demands of the youth strike movement (Fridays for Future, 2019), but it is not a prevalent discourse in the UK media, even in the context of the youth climate strikes (Graham & De Bell, 2020). Nor is it a prominent finding in research studies with adults; although adults express some guilt and concern about younger generations' future (e.g., Olausson, 2011), this is sometimes couched in arguments that younger rather than older generations are therefore most responsible for resolving climate change (e.g., Hanson-Easey, Williams, Hansen, Fogarty, & Bi, 2015) This might suggest that in the broader societal context, adolescents' understanding of climate change as an issue of intergenerational injustice constitutes a polemic representation. Polemic representations are defined by struggle and antagonistic group relations.

A sense of antagonism towards other groups was evident in Study 3 when participants talked about the blameworthiness of the government and older generations, who had a greater hand in causing climate change but would not suffer its harshest consequences. This sense of injustice was compounded by their lack of access to political representation, evidenced in debates about voting and the parallels drawn with Brexit, another event where the old were considered to have contributed to the detriment of the young. In Study 4, intergenerational injustice was acknowledged by all participants, regardless of whether or not they had chosen to attend a strike. This was not an issue about which there was any sense of debate and participants' anger was palpable. Although often characterised negatively, anger is associated with increased motivation to correct social injustice (Chapman, Lickel, & Markowitz, 2017) and outrage can be a driver for collective action (Spring, Cameron, & Cikara, 2018). If the theme of intergenerational injustice were to gain traction – if the media were to highlight the issue in their reporting for instance – this polemic representation could perhaps become hegemonic in the UK (Jaspal, Nerlich, & Cinnirella, 2013).

8.2.2 Functional Social Representations: Climate Change and Psychological Distance

Social representations are dynamic and functional. They can be employed to serve a purpose, such as to protect the self from threat (e.g., Joffe & Bettega, 2003) or to maintain hierarchies (e.g., Howarth, 2002). One way of keeping climate change at arm's length is to represent it as psychologically distant along spatial, temporal, social, or hypothetical lines (Trope & Liberman, 2010). This concept has typically been explored in relation to concern about and taking action on climate change (e.g., Spence, Poortinga, & Pidgeon, 2012). Representing climate change as more of a threat to distant others or as a natural rather than man-made phenomenon is found in studies with adult participants (Smith & Joffe, 2013; Smith, O'Connor, & Joffe, 2015; Wibeck, 2014). This highlights the functional nature of social representations; rendering the self less vulnerable or blameworthy is protective to the individual or in-group. However, there is debate about the extent to which viewing climate change as proximal increases concern or willingness to act (Brügger, Dessai, Devine-Wright, Morton, & Pidgeon, 2015). Proximity may be associated with increased engagement (Jones, Hine, & Marks, 2017). However, distance – particularly along social and spatial lines – can also increase willingness to act (Spence et al., 2012). Further, as the relationship between the related concept of personal experience with climate change and action demonstrates; proximity can evoke feelings of fear, denial, or avoidance (McDonald, Chai, & Newell, 2015). Equally, personal experience with perceived impacts of climate change, such as changing weather, can lead to greater acceptance and willingness to act on climate change (Akerlof, Maibach, Fitzgerald, Ceden, & Neuman, 2013).

Psychological distance is often considered then as a means to an end, rather than a phenomenon that may serve a function in and of itself. To date there is little research investigating whether adolescents view climate change as psychologically distant. One exception is a Swiss study (Gubler, Brügger, & Eyer, 2019) that found that adolescents viewed climate change as hypothetically and temporally proximal, but spatially and socially distant. The systematic review (Lee et al., 2020) highlighted the possibility that adolescents in the UK may view climate change as psychologically distant. An international study in the review found that participants in the UK expressed the lowest level of concern of the 11 included countries and were much less willing to change their transport behaviour than those in many other countries (Boyes et al., 2014). This could be a product of participants in the UK viewing climate change as a greater threat to other countries.

The findings of the empirical work reported earlier suggest a much more nuanced picture; that these participants represent climate change as both psychologically proximal and distant, depending on the particular dimension and context. In Study 1, many of the responses related to spatially distant impacts, such as melting ice and polar bears. However, there were also numerous responses in the 'weather' category that potentially implied proximity, particularly when they related to rain, or to a recent patch of unusually cold weather in the UK. Participants in Study 2 (Lee & Barnett, 2020) seemed to view climate change as socially and temporally

proximal and distant, and as spatially distant. Although there was some evidence of hypothetical distancing, the vast majority of questions implied certainty about the existence and severity of climate change.

In Study 3, participants negotiated with one another about the spatial, temporal and social distance of climate change, with some seemingly determined to resist climate change being depicted as proximal and others equally determined to position it as such. In Study 4, the focus on intergenerational injustice meant that climate change was positioned as socially proximal, because participants described their own generation to be facing more severe impacts of climate change. Talk about the goals of the strike movement and of '12 years to change' necessarily brought climate change into participants' lives directly. They used '12 years' and the notion of injustice to emphasise their own proximity to climate change, their vulnerability purposefully highlighted rather than diminished. Although this emphasises the threat to the self, it could be a functional way of representing climate change, if it persuades adults and those in power to give greater consideration to the impact of climate change on young people (Markowitz & Shariff, 2012).

8.2.3 Processes of Social Representation: Anchoring and Objectification

Anchoring and objectification are key concepts in SRT that help people transform the unfamiliar to the familiar (Moscovici, 1984). Anchoring involves drawing on existing knowledge to help orient a particular object. In studies with adults, climate change has been anchored to ozone layer depletion (Jaspal et al., 2013) and to experiences of the weather (Lorenzoni & Hulme, 2009; Olausson, 2011; Whitmarsh, 2009) and the latter appears the case here too. In Study 1, 'weather' was a prominent image category. This was also evident in Study 2 (Lee & Barnett, 2020) when participants referred to the colder-than-usual weather that had occurred in the UK that spring. Climate change was also anchored to science-fiction, when some participants in Study 1 responded with associations relating to explosions or space. Science-fiction concepts were even more prominent in Study 2 (Lee & Barnett, 2020) where future impacts and solutions were set in the context of the Earth exploding and interplanetary migration. These references were perhaps borrowed from familiar scenes in films or video games.

Objectification involves drawing on resources from the present to concretise the issue. These are often visual resources, but may also take the form of symbols, metaphors, or personification (Joffe, 2003). Polar bears (Wibeck, 2014) and silhouetted smokestacks (O'Neill & Smith, 2014) are common visual images used to objectify climate change. In Study 1, polar bears featured prominently and were almost singular amongst animals in the animal image category. In Studies 3 and 4, participants focused far less on the scientific aspects of climate change and far

more on it as a phenomenon embedded in socio-political systems; here polar bears were notable for their absence. Given the way China was discussed in Study 3 in relation to causes of climate change, it could be argued that China was personified as the cause of climate change. Here we can see how objectification offers a short-cut to simple, easy to grasp – and potentially over-simplified – understandings (Joffe, 2002); such as this positioning of China as uncomplicatedly responsible for causing climate change.

8.2.4 Social Representations of Climate Change: Implications for Action

Social representations of climate change are socially shared knowledge about climate change (Sammut, 2015). Socially shared knowledge has implications for action on climate change, about what is deemed necessary and possible and who or what is responsible. Climate change can be conceptualised as a technical issue – a scientific problem – or an adaptive issue – a scientific problem existing in a social, political, and economic context (O'Brien, 2018). Whereas a technical view typically leads to technical solutions, an adaptive view leads to solutions that consider the broader contextual factors in which climate change is situated. In this research, participants represented climate change as both a technical and adaptive problem depending on whether they were looking at climate change as a singular object, or as an object in context. In Studies 1 and 2, where the participants were asked to provide images associated with climate change and ask questions of scientists about climate change, they represented climate change as a scientific issue. It seems probable that free association responses would relate to more physical aspects of climate change (as they do in free association studies conducted with adults (Lorenzoni, Leiserowitz, De Franca Doria, Poortinga, & Pidgeon, 2006; Moloney et al., 2014). Similarly, an invitation to pose questions to scientists (Lee & Barnett, 2020) would likely be taken as a directive to focus specifically on the scientific aspects of climate change. Seemingly then, when they focused in on climate change as a scientific object, they represented it as a technical problem.

However, in Studies 3 and 4 climate change was represented as a socio-political and economic issue rather than a scientific one, as an adaptive, rather than a technical problem. This was the case for participants across the age range. In Study 3, participants discussed the physical causes of climate change (pollution or meat farming, for example) only briefly before moving on to discuss what lay behind these physical causes. They were much more interested in moving the focus outwards and talking about the political and economic context that facilitated climate change and impeded solutions to it. In so doing, they evidenced a sophisticated understanding of the way that climate change is embedded in systems of governance, wealth, and power. They presented developing countries, distant peoples, and themselves – rather than polar bears – as victims of climate change. This was also apparent in Study 4, where climate change was discussed as

an issue of generational inequity and self-evident governmental responsibility. Representing climate change as an adaptive problem (O'Brien, 2018) may be positive if focus on cultural, social, and political transformation is a more fruitful approach than one that exhorts 'following the science' (Evensen, 2019; Hulme, 2020).

8.2.5 Age-related Differences in Social Representations of Climate Change

Three factors: the different range of ages of participants in each study; the extent to which each study required or enabled them to think about climate change in a particular manner; and the specific method used in each study (i.e., the extent to which the method enabled elaboration, or not), make the identification of clear age-related differences in social representations somewhat difficult. That said, it is possible to make some tentative observations. Where the focus of the study and method used encouraged or enabled participants to focus on the scientific aspects of climate change (Studies 1 and 2), it seemed that older adolescents (aged 13-15) had integrated more specific and more scientific concepts into their representations of climate change than younger adolescents (age 11-13). This may be suggestive of the teaching of climate change in Chemistry and Science lessons impacting the representations of those old enough to have received that teaching. Where the focus and methods enabled elaboration on the social and political context in which climate change exists (Studies 3 and 4), all participants – aged 11 to 17 – represented climate change as an issue embedded in a social, political, and economic context, and depicted it as an issue of intergenerational injustice. Whilst older participants – as would be expected – were able to articulate their points in a more 'adult' fashion, the fundamental content of participants' commentary about intergenerational injustice was the same across the age range. Thus, it seems reasonable to speculate that there are age-related differences in social representations of the scientific aspects of climate change, but not in the positioning of climate change as an issue of intergenerational injustice.

8.3 Summary of the Theoretical Contribution of the Thesis

This thesis has contributed to SRT in two important ways. First, in extending the application of the theory to adolescents and the issue of climate change. Although previous studies with adults have taken an SRT approach to understandings of climate change (e.g., Moloney et al., 2014; Olausson, 2011; Smith & Joffe, 2013; Wibeck, 2014) and studies with children and adolescents have taken an SRT approach to a variety of issues, including HIV/AIDS (Joffe & Bettega, 2003), national identity (Dougherty, Eisenhart, & Webley, 1992), and disability (Harma, Gombert, & Roussey, 2013), the approach, age group, and topic taken in this thesis have not – to the best of my knowledge – been previously combined. The findings of the research in this thesis have demonstrated that adolescents represent climate

change as a clear and present danger, albeit a danger more threatening to others than themselves. They also represent climate change as an issue of intergenerational injustice, situated in and perpetuated by a social, political, and economic context.

Second, the research has provided evidence of the utility and functionality of social representations, highlighting the way that identities modulate what representations are taken up and how they are used to support a positive identity. In study 3, representations were deployed flexibly to maintain a positively-valenced self, whether talking about climate change causes, impacts, or solutions. In a similar way, representations of strikes and strikers in Study 4 were in accordance and sympathy with the participants' different identities. For example, strikers and would-be strikers adopted representations around intergenerational injustice and re-presented the more positive representations of strikes and strikers already out in the world (e.g., in the media). Non-strikers' representations also represented climate change as an issue of intergenerational injustice, but their non-striking identities were supported by their re-presentation of existing and less positive representations of strikes and strikers, maintaining their 'more moderate', or not 'other' identities. This suggests the potential utility of future research that explores the processes of identity that are maintained and supported by the deployment of particular climate change social representations, given that representations alone cannot necessarily be considered catalysts for instigating behaviour change (Jaspal et al., 2013). Identity Process Theory (Breakwell, 1993, 2001), which brings together aspects of SRT and Social Identity Theory (e.g., Tajfel, Turner, Austin, & Worchel, 1979) into a single explanatory framework, would provide a useful theoretical frame for future empirical exploration. This could help to identify the particular processes of identity that might lend themselves neatly to intervention.

8.4 Methodological insights

Historically, the methods employed to examine adolescents' perceptions of climate change have been predominantly quantitative (Lee et al., 2020). In contrast, the empirical studies here have employed solely qualitative methods. One of the aims of qualitative research is to generate new insights and understandings (Willig, 2013) and it seems reasonable to contend that the use of qualitative methods has facilitated the identification of fresh insights into adolescents' representations of climate change. Looking at adolescents' qualitative understandings has by definition, led to novel findings. For example, the finding that climate change is sometimes anchored to science fiction would likely not have been identified from experimental or survey data because questions about science fiction would not have been asked of participants. Using open-ended qualitative methods meant that participants were able to express in their own words their anger at older generations and the government or to give first-hand accounts of their experiences of striking.

A qualitative approach has been valuable in facilitating an understanding of the way that climate change is understood in nuanced and sometimes ostensibly contradictory ways. Some of the findings here appear incompatible with one another when taken at face value. One might ask for example, why, if participants are adamant that meat farming contributes so unequivocally to climate change, they defend so vociferously their own meat eating (Study 3)? Or why, when they feel so aggrieved about the injustice of climate change, some participants do not wish to take part in a strike (Study 4). A qualitative approach highlights that the expression of one view does not mean that another, perhaps on the face of it contradictory view, may not also be expressed as the logic of each argument can be made independently. In the case of the discussions about meat-eating in Study 3, arguments against meat farming were made on environmental grounds and then arguments for meat eating on nutritional grounds. This lays bare the presence of multiple meanings and interpretations (Billig, 1996) and the dependency of meaning upon context (Braun & Clarke, 2013).

Of perhaps particular value is the method employed in Study 2 (Lee & Barnett, 2020). This enabled participants to ask their own questions, as opposed to respond to others' questions, as is more usual. This is an infrequently used method (for exceptions see Baram-Tsabari, Sethi, Bry, & Yarden, 2006; Demirdogen & Cakmakci, 2014; Tolppanen & Aksela, 2018), yet one that appears fruitful in providing insight into which facets of an issue people are most interested in and on what assumptions their questions may be predicated. Participants in this study seemed most exercised by future impacts and solutions to climate change. Whilst this approach was not employed to test knowledge, it had unexpected utility in highlighting a propensity to anchor climate change to science-fiction. This method may be useful for other researchers investigating climate change or other topics. Further, it is straightforward to facilitate and given the digital format, likely a fairly natural experience for adolescent and young participants, who are 'digital natives' (Seemiller & Grace, 2017)

8.5 Limitations

8.5.1 Sampling limitations

Apart from participants in Study 2 (Lee & Barnett, 2020), all participants were recruited from a relatively small geographical area in the South West of England. The school through which participants in Study 1 were recruited is in an area more socially advantaged than the UK average. Recruiting participants through their parents – a necessity for under 16s – also leads to potential sampling bias, in that participation is dictated by parents and so probably to some degree, by their own outlook towards climate change. Children of non-sceptical parents would likely be non-sceptical too; acceptance of climate change amongst family members is

associated with higher levels of acceptance in adolescents (Stevenson, Peterson, & Bondell, 2019).

8.5.2 Methodological limitations

One general methodological limitation is that all of these studies were cross-sectional, data were collected at a single point in time. With the benefit of hindsight, it would have been particularly valuable and interesting – especially given the emergence of the strike movement in the second half of the PhD – to have employed a longitudinal design to gain an appreciation of any changes to representations of climate change over this time (permission was given by some participants in Study 4 to be recontacted for future research). Another, discussed in the Chapter 2, is that there no absolute consensus about how the quality of qualitative research should be assessed (e.g., Rolfe, 2006; Yardley, 2000). Further, it is feasible that other interpretations of these data could have been made, although care has been taken to ensure claims have been well-supported by the data, and illustrative examples provided. Constructionist, qualitative research does not produce data that can be generalised in the same way as data from positivist, quantitative research. The concept of empirical generalisation – the application of findings to wider populations and settings (Hammersley, 1992) – is associated with quantitative research and is not claimed here. However, theoretical generalisation – whether the generated concepts may have wider applicability that can be further studied – is applicable to qualitative research such as this (Richie & Lewis, 2004). It is not suggested therefore that the concepts identified in this research can be applied to the population at large as universal laws, but that they are propositions worthy of investigation in future research (Barnett & Vasileiou, 2020).

All methods have limitations, including those employed here. Free association tasks give insight into participants' spontaneous and unconstrained thoughts about an object (Peters & Slovic, 1996) but not detail about what prompted their responses. The interactive nature of focus groups facilitates the co-production of understandings (Kitzinger, 1994) and they are relatively naturalistic (Wellings, Branigan, & Mitchell, 2000), but they can be difficult to manage (Braun & Clarke, 2013). Interviews can generate rich and detailed data about a specific issue from an encounter that resembles everyday conversation (Flick, 2017), but they can be unpredictable and may go off course (Rubin & Rubin, 1995). The benefits and limitations of each of the methods used in this research and their appropriateness to the research questions being asked were considered carefully, and other options were examined. For example, a qualitative survey was considered for Study 4 as this would have (probably) delivered a much larger and more diverse sample than interviews.

8.6 Future Research

The findings here indicate several avenues for future research. Most obviously perhaps, to conduct similar studies with different groups of adolescents across the UK, and potentially in different countries, to explore how other groups of adolescents represent climate change. This work has highlighted ways of representing climate change that could be explored quantitatively. It would be useful to examine the existence and prevalence of some of the concepts identified here amongst larger groups and to draw comparisons across age, gender, and location. For example, is associating climate change with science-fiction a common phenomenon and if so, is it more associated with particular age groups or genders? Do socio-political – or adaptive - frames of climate change have a particular impact on climate change engagement, attitudes, and behaviours? Does attending strikes predict long-term engagement with climate change? Studies with longitudinal design would be useful in providing understanding about the extent to which representations of climate change may change over time and if so, why and how such changes occur.

Participants in these studies did not express much in the way of fear, anxiety, or hopelessness – emotions considered in some existing research (e.g., Ojala, 2012; Ojala, 2013) – but did express anger at older generations and governments, both for allowing the situation to happen and for their perceived inertia. Negative emotions – including anger – may be adaptive (Verplanken, Marks, & Dobrimir, 2020) and future research could examine whether feelings of anger at intergenerational injustice may motivate action on climate change amongst adolescents and adults. Of particular interest would be to better understand any relationship between the strike movement and the way climate change is represented by strikers, non-strikers, and the public at large. For example, what impact does the strike movement have on the psychological distance of climate change?

8.7 Implications for Policy and Practice

These findings have three key implications for policy and practice, in relation to the school curricula, government policy on climate change, and the extension of political representation to 16-year-olds.

8.7.1 Climate change and the curricula: earlier teaching and teaching across subjects

Educational reform is one of the demands made by the strike movement (Fridays for Future, 2019). Currently, formal teaching about climate change in Geography and Science does not begin in the UK until pupils are in their second or third year of secondary school (Department for Education, 2014). Critics argue that following changes to the curricula specifications in 2013, schools can avoid teaching about climate change directly if they wish and instead focus on the more nebulous

‘environmental change’ (Harvey, 2020). The findings of this research point to changes that could helpfully be made to the school curricula: teaching about climate change at an earlier stage and teaching about it across the curricula.

Participants in the presented studies were aware of climate change and the threat it represents. They already hold representations of climate change, and some – such as those involving extreme disaster or science-fiction – that may induce fear or anxiety. As early adolescence is a pivotal time for climate change education (Harker-Schuch, 2019), it seems logical to start formal teaching about climate change earlier than is currently the case. Second, these participants did not represent climate change as simply a scientific or environmental issue but also a socio-political one. Climate change is not and need not only be considered relevant to Geography and Science lessons but to humanities subjects too, to help young people think critically about how the past has shaped the present, how human activity has led to the current crisis, and how accepted-as-truth historical and current frames may need to be challenged (Power, 2020). Developing these critical thinking skills could help to drive societal transformation on climate change (O’Brien, Selboe, & Hayward, 2018).

8.7.2 Political action on climate change: now not later

The participants in Studies 3 and 4 represented climate change as an issue embedded in socio-political and economic systems. They recognised the unfairness and unjustness of facing more severe impacts of climate change than those with the power to make decisions on their behalf (Sanson & Burke, 2020). They appreciated that those in power need to be persuaded to change the system. Crucially, they conceptualised effective solutions to climate change arising from economic, political, and societal change rather than from individual behaviour change. This view is consonant with those who have been critical of government policies that have focused on changing individual behaviour (e.g., Defra, 2008), because this approach distracts from the more fundamental change that is really needed (e.g., Shove, 2003). Although changing individual behaviour at scale can reduce emissions, marginal individual change leads to marginal collective change rather than to wholesale change (Thøgersen & Crompton, 2009). Marginal collective change is of course better than no change, but it is insufficient alone. This individualistic approach to change is perhaps the product of a neoliberal political and economic system (Capstick, Lorenzoni, Corner, & Whitmarsh, 2014). Certainly, parallels can be drawn with policy approaches to improving health outcomes that focus on individual behaviour change, despite overwhelming evidence pointing to the importance of wider structural and societal factors (Baum & Fisher, 2014).

The COVID-19 pandemic and subsequent lockdowns in many countries led to a temporary reduction in global CO₂ emissions (Le Quéré et al., 2020) that had a very small effect on global temperatures (Weber et al., 2020). That severe

lockdowns do not reduce emissions enough to impact climate change in the longer term underscores the limits of individual behaviour change and the need to make the wide-reaching economic and political changes necessary to move away from fossil fuel reliance (Weber et al., 2020). The UK public now seem supportive of fairly radical action on climate change, much of which would require government intervention or legislation (Climate Assembly UK, 2020). Although the government can enact far-reaching policy changes as they see fit without strong public support (see: Austerity), such public support for action could give the UK government additional motivation to address the gap between its stated climate goals and its climate-related policies (Somerville, 2020). The relationship between policy and public opinion may be bi-directional; public support for environmental behaviours can increase on the back of policy change (Thomas, Sautkina, Poortinga, Wolstenholme, & Whitmarsh, 2019). Global parties to the delayed COP26 in November 2021 have the chance to set a new course that focuses on delivery rather than promises.

8.7.3 Political representation: votes at 16?

Finally, the participants in this research were aware that they will likely face more severe impacts of climate change than adults (Lewis, 2018), but as adolescents they have limited direct access to political representation in the UK (Graham & De Bell, 2020). This raises the question of whether political representation should be extended to adolescents in the UK. The Scottish and Welsh Parliaments have extended voting rights to 16 year olds but thus far England has not followed suit, with voting starting at 18 (Electoral Reform Society, 2020). The major opposition parties in the UK have expressed support for lowering the voting age to 16 (Green Party, 2017; Labour, 2017; Liberal Democrats, 2018). A cynical take could be that this may be as much about the potential electoral advantage this might confer as enfranchising young people; notably the governing Conservative party, who poll far better with older than younger voters, do not support lowering the voting age (YouGov, 2019), although some Conservative MPs are supportive (British Youth Council, 2020).

As a general point, it is difficult to understand the logic behind a 16- or 17-year old being considered too immature to vote, when a 10-year old can be considered sufficiently mature to be held criminally responsible (CPS, 2020). In the specific context of climate change, where the increased risk to young people is acknowledged (Costello et al., 2009; Hansen et al., 2013), expanding enfranchisement to include younger voters is surely morally necessary. There is precedent: history shows us that the right to vote is a moveable feast; the voting age was last reduced from 21 to 18 in 1969 (House of Commons Library, 2020). Arguments that extending the right to vote to 16- and 17-year olds reduces turnout (e.g., Blais & Rubenson, 2013) are not necessarily compelling; turnout amongst Scottish 16- and 17-year olds in the 2014 independence referendum was higher than for 18- to 24-year olds (The Electoral Commission, 2014), with the

same pattern found in Austria (Zeglovits & Aichholzer, 2014). Further, parents are more likely to vote themselves when their child first votes, so extending the vote to those likely to be living at home could have a positive impact on turnout amongst older generations (Dahlgaard, 2018).

8.8 Conclusion

This thesis aimed to reveal and examine adolescents' representations of climate change. Using a qualitative research approach, the intention was to understand what climate change means to them and how and where they situate it in relation to their own and others' lives. Climate change was represented as a real, anthropogenic phenomenon with far-reaching consequences for the planet, its occupants, and for participants personally. However, what climate change meant to them was dependent upon whether it was viewed close up as a scientific object or viewed as an issue set within the broader socio-political context.

Up close, it was represented by associations with heat, melting ice, the weather, and polar bears. It was sometimes associated with disaster imagery and concepts reminiscent of science-fiction. More severe consequences were often, but not always, placed at a distance. Viewed in context, participants represented climate change as an issue situated within local and global political and economic forces. They depicted it as an issue of intergenerational injustice, with their generation unfairly impacted by a climate change that others had caused. They expressed anger at this and their own powerless status, holding the government almost singularly responsible for resolving climate change. However, although united on the issue of intergenerational injustice, participants expressed differing views on the likely effectiveness of the youth climate strikes and about those involved in the movement.

This research aimed to give adolescents the space and opportunity to express their own understandings of climate change. This has highlighted facets of their understandings that could be the focus of future research. It has shown that they understand the complexity of the problem and also the (relative) simplicity of what they present as the solution: concerted and wide-reaching change spearheaded by government. Enacting these changes and supporting and empowering adolescents and future generations to realise a future they deserve is surely necessary.

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Appendix A: Ethical Approvals

Dear Katharine,

Full title of study: Children's representations of climate change: a word association study

SSREC reference number: S17-020

On behalf of the Social Sciences Research Ethics Committee (SSREC), I am pleased to confirm a favourable ethical opinion of the above research on the basis described in the application form and supporting documentation.

Please inform SSREC about any substantial amendments made to the study if they have ethical implications.

Kind Regards

Rebecca Wise

On behalf of SSREC

'Do polar bears melt?' A qualitative analysis of children's questions about climate change

But given the nature of the project we resolved this afternoon that I give it ethical approval via Chair's Action with the caveat that when we do hear back from Fiona, additional ethics oversight may be required. I can't see any reason why this should delay your data collection, it would just be a box-ticking exercise to ensure you are appropriately covered.

The ethics code associated with this application is S17-026. This code should be included on any internal documents as proof of ethical approval.

Best of luck with your research,

Dr. Nathalia Gjersoe

Deputy Chair, Social Sciences Research Ethics Committee

18-316 Lee: Adolescents' talk about climate change

Hi Katharine

On going through your comments again it was felt that you had covered everything and we are now happy to approve.

BW

Rebecca

Dear Katharine

Full title of study: Children and adolescents' understandings of their climate change activism
PREC reference number: 19-115

On behalf of the Committee, I am pleased to confirm that you have received full ethical approval for the above proposal from the Psychology Research Ethics Committee.

If you intend to display recruitment posters/materials, please ensure you obtain the appropriate permission to do so from those who manage the location(s) you choose.

Please inform PREC about any substantial amendments made to the study if they have ethical implications.

Please make sure you quote your unique PREC code, 19-115, in any future correspondence.

Appendix B: Materials Study 1

INFORMATION SHEET

Ethical approval code S17-020

Word Association Task – Sustainable Futures

Who am I and what is this piece of research about?

My name is Katharine Lee and I am a PhD student in the Department of Psychology at the University of Bath. Most research into what people think about environmental issues is conducted with adults but it is just as important that we understand how young people think and feel about them. This is the purpose of my PhD and this piece of research.

What would I need to do?

You would undertake a short pencil and paper word association task. This involves writing down three images that come to mind when you read a certain word or phrase. You can write more than one word for each image. For example, the word or phrase could be “the solar system” and you might think of ‘planets going round the sun’, ‘the milky way’ and ‘asteroids’. After you have written down each image, you will be asked to say how positive or negative you feel about it.

So as an example – if you said ‘asteroids’ and you felt very positive about them - you would circle the face indicated below:

You will then be asked to
one final question.



respond to

This should take no longer than five minutes to complete. It is not a test and there are no right or wrong answers, I just want you to write whatever comes into your head.

Do I have to take part?

No. Taking part is completely voluntary. You can choose not to take part, or you can choose not to hand in your task sheet to the teacher at the end. Once you have handed in your task sheet to the teacher your answers will be included in the study because you have not provided your name and it will not be possible to identify you and remove you.

What will happen to the information I provide?

You are not giving us your name, so the information you provide will be completely anonymous. You are only being asked to give your age and gender to help us to organise the findings. Once the project is completed, the information you have given will be kept securely by the University of Bath.

What will happen to the results of the research?

What you tell us will inform our project about how young people think and feel about environmental issues. The findings of the research may be published in research journals or used in presentations. A summary of the findings will be given to the school.

Many thanks for taking the time to read this. I would be delighted if you would take part.

SPONTANEOUS WORD ASSOCIATION TASK

Please tick the boxes below that apply to you:

My age is	11	12 <input type="checkbox"/>	13 <input type="checkbox"/>	14 <input type="checkbox"/>	15 <input type="checkbox"/>	<input type="checkbox"/>
My year group is	7	8 <input type="checkbox"/>	9 <input type="checkbox"/>	10 <input type="checkbox"/>	<input type="checkbox"/>	
My gender is	Male	<input type="checkbox"/>	male	<input type="checkbox"/>	Prefer not to say	<input type="checkbox"/>

Please write down in the box the first image that comes to mind when you think of the words
'climate change'

How positive or negative do you feel about this image? Please circle the face below that most closely reflects how you feel about it.



Now please write down in the box the second image that comes to mind when you think of the words **'climate change'**:

How positive or negative do you feel about this image? Please circle the face below that most closely reflects how you feel about it:



Now please write down in the box the third image that comes to mind when you think of the words **'climate change'**:

How positive or negative do you feel about this image? Please circle the face below that most closely reflects how you feel about it:



TEACHER BRIEFING AND DEBRIEFING SHEET

Dear Teacher

Thank you for facilitating this study in your class, it is much appreciated.

As far as possible, please try to deter pupils from looking at the task sheet prior to commencement. Please could you make sure that pupils are presented with the information sheet side first. Please do not review what the children have written as it is important that they do not feel that this is an academic test. You will have been made aware in advance of any pupil in your class who has been opted out of the study by their parent or carer. In these instances, as well as in the case of any pupil who does not wish to participate, please could you give them some normal class-related work (e.g., reading) to do whilst other children are completing the task.

Below are some instructions to read out to the class before and after the task. Text to be read out is in bold.

To read out BEFORE the task:

The school has agreed to help a University of Bath PhD student with a study that investigates young people's thoughts about sustainability issues, as the topic links to our curriculum in Geography. You have a sheet of paper on your desk. The first side gives information about the study. Please read this carefully now.

At this point, pupils should read the sheet and have the opportunity to ask any questions. After they have finished reading, please then ask them to raise their hands if they would like to take part. Anyone who does not wish to take part should do some normal class-related work as above. Those who wish to take part should now be instructed:

You can now begin the task, which is on the other side of the sheet of paper.

AFTER the task is finished, please could you collect completed task sheets in the box provided and read out the following:

Thank you very much for taking part. The aim of the study was to find out your spontaneous thoughts and feelings about climate change. Most academic research about young people and climate change measures how much they know about the topic, and whether what they know is scientifically accurate or not. The aim of this study was not to find out whether you know accurate facts about climate change but rather, how you think and feel about it and which aspects are important to you. The researcher is going to share the findings with us once the analysis has been completed.

THANKS VERY MUCH!

Appendix C: Materials Study 3

Focus group schedule

Set up and introductions

Clarification that there is no right or wrong, we are looking for everybody's thoughts and opinions. All thoughts and opinions are valid. Let's ensure that everybody is able to speak and please can we try not to talk over one another.

Introductions – name, age etc

Starter question

What is the first thing that comes to mind when I say 'climate change'?

Why do you say that?

Are there particular images that you associate with climate change?

Why do you associate these images with climate change?

Do you ever think of science fiction images?

Questions about exposure to climate change information

Do you think climate change is real?

Why/why not?

How do you know what you know about climate change?

What have you heard about it at school?

What have you heard about it from elsewhere?

Do you seek out information about climate change? If so, where from?

Questions about causes of climate change

What do you think causes climate change?

Do you think that some countries are more responsible than others for causing climate change?

Questions about impacts of climate change

What do you think are the impacts of climate change?

Are some countries seeing more impacts than others?

What do you think will happen in the future?

Questions about solutions to climate change

What do you think are the solutions to climate change?

Who is responsible for resolving climate change?

Why do some have/not have responsibility?

Closing question

Do you have anything else you would like to share?

ADOLESCENT ASSENT FORM
Adolescents' talk about climate change

Please answer the following questions to the best of your knowledge

YES NO

DO YOU CONFIRM THAT YOU: _____

Are aged between 11 and 15 _____ _____

HAVE YOU: _____

been given information explaining about the study? _____ _____

had an opportunity to ask questions about the study? _____ _____

understood enough about the study for you to make a decision

about your participation? _____ _____

DO YOU UNDERSTAND:

_____ That you can withdraw from the study:

at any time up two weeks after the focus group? _____ _____

without having to give a reason for withdrawing? _____ _____

I hereby fully and freely consent to my participation in this study

I understand the nature and purpose of study. These have been communicated to me on the information sheet

I understand and acknowledge that the investigation is designed to promote scientific knowledge and that the University of Bath will use the data I provide for no purpose other than research.

I understand that the data I provide will be kept **securely**, and that when the audio file is typed up my data will be **anonymised** by removing all links between my name or other identifying information and my study data.

Participant's signature: _____ Date: _____

Name in CAPITAL Letters: _____

Age: _____

If you have any concerns related to your participation in this study please direct them to the Department of Psychology Research Ethics Committee, via email: psychology-ethics@bath.ac.uk.

PLEASE BRING THIS FORM ALONG TO YOUR FOCUS GROUP. IF YOU DO NOT BRING A COMPLETED FORM THEN YOU WILL NOT BE ABLE TO TAKE PART!



Debriefing Information
Adolescents' talk about climate change

Thank you for taking part in this project which has been investigating what young people think and feel about climate change.

The findings from this focus group, and others, will help to inform the project.

If you would like to speak to us about the project, please get in touch.

Email – k.lee@bath.ac.uk Phone – 01225 383788

You can also speak to the supervisor of the project, Professor Julie Barnett

Email – j.c.barnett@bath.ac.uk Phone – 01225 383788

Our address is: Department of Psychology, University of Bath, Claverton Down Bath, BA2 7AY

.....

.....

I confirm I have received an Amazon voucher to the value of £10 for participating in the University of Bath project 'Adolescents' talk about climate change'

Signed.....

Date.....

Researcher's signature.....

Date.....

If you have any concerns about the ethics of this research study, please contact the Bath University Psychology Department Research Executive Officer, Dr. Jie Sui Email: psychology-ethics@bath.ac.uk Phone: 01225 38 4322

Appendix D: Materials Study 4

INTERVIEW SCHEDULE

Adolescents' Views of Youth Climate Activism

Schedule A – for participants who have taken part in a climate strike

What do you know about the strikes?

How did you hear about them? Where from?

What made you decide to take part in the strikes?

What were the reasons that made you take part?

Was there any reason that was particularly important?

Why do you think other young people are taking part in the strikes?

Do you think they are doing it for the same reasons as you? Or for different reasons?

Were people supportive or unsupportive of you going?

Did anyone try to persuade you not to go?

Did you go with anyone else?

Did you go alone, or with friends, family? Why this arrangement? Do you wish it had been different?

What happened when you got there?

What was the atmosphere like, how many people were there, what were you/other people doing?

How did the people passing by react? How did this make you feel?

Were people passing by supportive/unsupportive?

How did you feel about the experience?

Can you say a bit more about that?

Have your teachers/your school reacted to you taking part and to the strikes in general?

What was their reaction? How do you know about these reactions? What do you think about the way they have reacted? Do you agree with the way they have reacted? Why/Why not?

Have your friends and family reacted to you taking part and to the strikes in general? What do you think about the way they have reacted?

What was their reaction? How do you know about these reactions? What do you think about the way they have reacted? Do you agree with the way they have reacted? Why/Why not?

Have you heard any other reactions to the strikes from people like celebrities, journalists, or politicians? What do you think about the way they have reacted?

What was their reaction? How do you know about these reactions? What do you think about the way they have reacted? Do you agree with the way they have reacted? Why/Why not?

Do you think you will attend future strikes?

Why? Why not?

What do you think the strikes are meant to achieve?

What is intended to happen as a result?

What do you think the strikes are likely to achieve?
What do you think will happen as a result?

Schedule B – for participants who have not taken part in a climate strike themselves

What do you know about the strikes?
How did you hear about them? Where from?

Did you think about taking part in a strike?
If yes, why did you decide against it?
Was there anything that was particularly important in making you not go?

Were people supportive or unsupportive of you not going?
Did anyone try to persuade you to go?

Do you know anyone who has taken part in a strike?
Have any of your peers, friends, family members or anyone else you know taken part?

Why do you think they took part?

What do you think about people taking part in the strikes?
Do you think taking part is a good or a bad thing? Why/Why not?

Have your teachers/your schools reacted to people going on the strikes?
What was their reaction? How do you know about these reactions? What do you think about the way they have reacted? Do you agree with the way they have reacted? Why/Why not?

Have your friends and family reacted to people going on the strikes?
What was their reaction? How do you know about these reactions? What do you think about the way they have reacted? Do you agree with the way they have reacted? Why/Why not?

Have you heard any other reactions to the strikes from people like celebrities, journalists or politicians?
What was their reaction? How do you know about these reactions? What do you think about the way they have reacted? Do you agree with the way they have reacted? Why/Why not?

Would you consider taking part in future strikes?
Why/Why Not?

What do you think the strikes are meant to achieve?
What is intended to happen as a result?

What do you think the strikes are likely to achieve?
What do you think will happen as a result?

11-15 YEAR OLD ADOLESCENT ASSENT FORM
Adolescents' Views of Youth Climate Activism

Please answer the following questions to the best of your knowledge

YES NO
DO YOU CONFIRM THAT YOU:
Are aged between 11 and 15

HAVE YOU:
read the above information about the study
understood enough about the study for you to make a decision
about your participation?

DO YOU UNDERSTAND:
That you can withdraw from the study:
at any time prior to two weeks after the interview?
without having to give a reason for withdrawing?

I understand the nature and purpose of the study

I understand that the data I provide will be kept **confidential**. My name or other identifying information will not be disclosed in any presentation or publication of the research.

I understand and acknowledge that the investigation is designed to promote scientific knowledge and that the University of Bath will use the data I provide for no purpose other than research

I HEREBY GIVE CONSENT TO MY PARTICIPATION _____

DATE _____

MY AGE AND SCHOOL YEAR GROUP _____

If you have any concerns related to your participation in this study please direct them to the Department of Psychology Research Ethics Committee, via email: psychology-ethics@bath.ac.uk.

CONSENT FORM FOR 16-18 YEAR OLDS
Adolescents' Perceptions of Youth Climate Activism

Please answer the following questions to the best of your knowledge

YES **NO**

DO YOU CONFIRM THAT YOU:

Are aged 16-18

HAVE YOU:

read the above information above that explains the purpose of the study?
received enough information about the study for you to make a decision
about your participation?

DO YOU UNDERSTAND:

that you are free to withdraw from the study
at any time prior to two weeks after the interview?
without having to give a reason for withdrawing?

I hereby fully and freely consent to my participation in this study

I understand the nature and purpose of the procedures involved in this study. These have been communicated to me on the information sheet accompanying this form.

I understand and acknowledge that the investigation is designed to promote scientific knowledge and that the University of Bath will use the data I provide for no purpose other than research.

I understand the data I provide will be kept **confidential**. My name or other identifying information will not be disclosed in any presentation or publication of the research.

I understand that the University of Bath may use the data collected for this project in a future research project but that the conditions on this form under which I have provided the data will still apply.

I HEREBY GIVE CONSENT TO MY PARTICIPATION _____

DATE _____

MY AGE AND SCHOOL YEAR GROUP _____

I agree to being contacted again with information about future research studies? YES
NO

If yes, please give contact email _____

If you consent to be contacted again then your details will be stored in encrypted form on a password-protected drive on the University of Bath's x-drive. These details will be stored for five years and will then be destroyed. If we contact you again, we will not send you more than two emails, if you do not reply, your details will be removed from the database.

If you have any concerns related to your participation in this study please direct them to the Department of Psychology Research Ethics Committee, via email: psychology-ethics@bath.ac.uk.

Participant information sheet

Adolescents' Views of Youth Climate Activism

What is this about?

We would like you to help us with our research project, which is about how young people think and feel about the recent youth climate strikes. This involves taking part in an interview that will last approximately 30-45 minutes. It is up to you whether you want to take part, if you don't, that is absolutely fine.

Why have you been asked to take part?

Because you are an adolescent aged 11-18 years old.

What would taking part involve?

It would involve taking part in an interview, this should last no longer than 45 minutes. There are absolutely no right or wrong answers, we just want to hear what you think.

Are there any reasons why I should not take part?

If you are not 11-18 years old.

What are the benefits of taking part?

There are no obvious direct benefits but the information you give will help us to understand more about how young people view youth climate activism.

What are the possible disadvantages and risks of taking part?

There are no obvious disadvantages or risks.

Who will have access to the information I provide?

All information will be kept confidential and stored securely in accordance with GDPR.

What will happen to the data collected and the result of the project?

Following rules set out by the University of Bath and the Data Protection Act, we will keep the information you provide for ten years. After this time, it will be destroyed.

What you say will be considered alongside the information provided by the other participants. We may publish findings in a journal or magazine, but you will not be identifiable because you will be given a pseudonym (we will not use your real name).

Can I stop taking part in the project after it has started?

You can stop the interview at any time, right up until completing it. Once you've completed it, you will be able to withdraw your data for two weeks.